FARMERS DIGEST

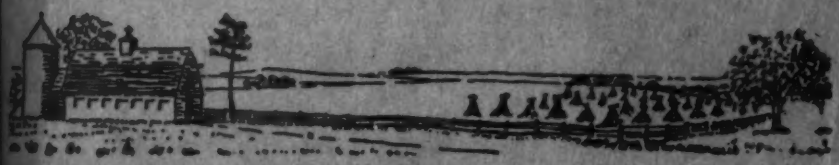
June–July, 1951

Volume 15 — $2.50 a Year
Number 2 — 25¢ a Copy

LIBF CURRENT AUG 1 1951

Nitrogen ..... *Successful Farming* 1
Factors Limiting Milk Production ..... *Guernsey Breeders' Journal* 7
Making Grass Silage Without Molasses ..... *New Jersey Farm & Garden* 10
Alfalfa, Queen of Forage Crops ..... *Better Crops with Plant Food* 13
What Rent for Your Farm ..... *Iowa Farm Science* 19
The Fly Problem ..... *The Jersey Bulletin* 25
Death for the Gypsy Moth ..... *American Forests* 35
Band Seeded Legumes? ..... *Ohio Farm and Home Research* 41
Copper Deficiency in Young Animals ..... *Land News* 47
Chemical Weed Control ..... *American Agriculturist* 50
How Many Litters Per Year? ..... *American Hampshire Herdsman* 52
Lipizzan Stallions of Austria ..... *Think Magazine* 54
Lespedeza Was Good News in 1922 ..... *The Missouri Farmer* 57
Controlling Newcastle Disease ..... *Poultry Tribune* 59
Birdsfoot Trefoil ..... *New England Homestead* 63
Estimating Weight of Steers ..... *Farm and Home Science* 65
With Radioisotopes ..... *Ohio Farmer* 67
Fighting Weeds with Beetles ..... *Farm Journal* 71
Lost—Seven Cows ..... *The Kraftsman* 72
No Legs—No Cow ..... *Holstein-Friesian World* 75
Cane Fruits for Home Garden ..... *Flower Grower* 79
Irrigation—5 HP Style ..... *Electricity on the Farm* 84
Super-Pastures ..... *Cappers Farmer* 88
Reducing the Farm Gamble ..... *The Farmer* 91
Index 94

For the Farmer's Library



The Farmer's Digest

EDITORIAL STAFF:
Editor—L. Bush-Brown Assistant Editor—C. Leavitt Dyer
Business Manager—A. E. Heick

Associate Editors—
John A. Andrew, Jr., James Bush-Brown, Ruth Patrick

ADVISORY EDITORIAL STAFF:

William A. Albrecht
Chairman, Department of Soils
University of Missouri

John D. Beck
Professor of Veterinary Medicine
University of Pennsylvania

Hugh H. Bennett
Chief, U. S. Soil Conservation Service

H. J. Reed
Dean of the School of Agriculture
Director of the Experiment Station and of
Agricultural Extension, Purdue University

W. T. Spanton
Chief, Agricultural Education Service
United States Office of Education

M. L. Wilson
Director of Agricultural Extension
United States Department of Agriculture

The Farmer's Digest
Published Monthly except July and September at Ambler,
Pennsylvania, by the Farmer's Digest, Inc.

25¢ a Copy *1 Year $2.50*
2 Years $4.50 *3 Years $6.50*
Canadian and Foreign Subscriptions $3.00 a Year

Entered as second-class matter at the Post Office at Ambler, Pa., July 30, 1948, under act of March 3, 1879. Additional entry at Lancaster, Pa.

The Farmer's Digest

Volume 15 June–July 1951 Number 2

Nitrogen

Condensed from Successful Farming

K. C. Berger and Z. H. Beers

You can save a dime and lose a dollar when you skimp on nitrogen for your crops.

How fast your crops grow depends more on nitrogen than upon any other nutrient. It does take phosphorus for young plant cells to divide to make new ones, but without nitrogen there would be nothing to divide. It takes phosphorus and potash to make stiff straw and stalks, but without nitrogen there would be no stalks!

On all crops, the characteristic sign of nitrogen hunger is the yellowish-green color of the leaves. The broad leaves of corn show it plainly. First, the tip of the leaf will turn yellow. The yellow color will run down the midrib to the base of the leaf. Then the yellow tissue will turn brown and die.

The kernels on ears from corn starved for nitrogen likely will have good color and fair luster, but the ears will be small. You will see evidences of more kernels having been formed but not filled, for the corn plant seems to have the power to limit the number of kernels to the necessary amount of nitrogen to finish them.

Yellow leaves and stunted plants are about the only signs of nitrogen hunger on small grains. The tips of the leaves will be fired and the whole plant a light yellowish-green.

Tomato leaves will turn a light green for lack of nitrogen, with purple veins on the underside. In the later stages, the leaf will be extremely yellow with a slight bronzing of the stalk.

Potato plants starved for nitrogen will show light green leaves and be stunted. The edges of the leaves will roll and cup. More nitrogen hunger will cause the edges of the leaves to turn white and paper thin, with more severe rolling and cupping.

Reprinted by permission from Successful Farming, Des Moines, Iowa, April 1951

Too much nitrogen, on the other hand, can mean weak, watery growth. Small grains will lodge easily. Tomatoes will make excessive plant growth and the flowers will not set fruit. Too much nitrogen during the early growth of corn may mean more stalk growth than is needed to make the crop.

All this means that the first number in the fertilizer grade—the one telling how much nitrogen the fertilizer contains, such as the 3 in 3-12-12—can make a great difference in the money you have left after paying crop-production expenses.

More careful management is needed for the efficient use of nitrogen than for either phosphate or potash. You not only need to maintain the supply in the soil, but you need to be sure that your crops have the nitrogen when they need it during the growing season.

Stock-piling nitrogen in the soil means stock-piling organic matter. That's next to impossible on light, sandy soils—and not easy on cultivated heavier soils. And if you can stock-pile organic matter you have the problem of regulating its release, so that crops can use it when they need it most.

When nitrogen is in the form crops can use, you have the problem of keeping it in the soil. In those forms it can move up and down with soil water, and be leached out with drainage waters. In dry weather it may collect in dry surface soil—where crops can't use it. So, maintaining enough nitrogen means constant additions of organic matter in crop residues, manure, green manure crops, legumes and sod crops, and in the proper grade of commercial fertilizer.

Part of the nitrogen for your crops comes from the stock pile of organic matter in the soil. On the western edges of the Cornbelt, that may be enough for the entire crop. On sandy soils, there will be almost none. The more clay in the soil, the easier it is to accumulate organic matter. For the clay will absorb organic nitrogen, making it harder for the soil microorganisms to break it down. The colder the soil and the longer the winter, the easier it is to accumulate organic matter. The time the organisms have to work on the organic matter is shortened and more such matter will be stock-piled in the soil.

When you have row crops on the land, the organic matter will be burned out faster than it is replaced. Under sods, organic matter will accumulate. Especially on the heavier soils. It pays to try to build this stock pile.

You can add nitrogen by adding crop residues. Bacteria will work on the parts of those plants that are easy to break down, and release the nitrogen from them

rather quickly. The woody parts of the plant will be harder to break down and will last as a nitrogen source over a longer period in the summer.

Or, you can add nitrogen in manure. But more than half of manure's nitrogen is in the liquid part. Lose the liquid, and you have lost more than half of the 10 pounds in an average ton of manure. Stack what's left outside in the rain and snow, and you can lose half of the rest of the nitrogen.

You can add nitrogen for crops by growing well-inoculated legumes. The bacteria that lives on legume roots will "fix" nitrogen from the air into forms crops can use.

The more growth you get on legumes, the more nitrogen the bacteria will fix. So, it pays to keep legumes well fed with lime, phosphate, potash, and the other nutrients they need. Alfalfa, sweet clover, and Ladino clover will add more nitrogen to the soil than will red clover, alsike, and lespedeza.

On some soils these several sources of nitrogen may provide all the nitrogen your other crops need. But on most soils extra nitrogen is needed, either because there is not enough total nitrogen in the soil, or because there is not enough at certain times during the year. Then, it pays to use the extra nitrogen in fertilizers.

There is need for extra nitrogen on many soils when the crops are young—at the seedling stage—particularly during cold, wet springs. Then, the bacteria in the soil are sluggish and do not release enough nitrogen.

Extra nitrogen may be needed by winter small grains during cold, wet springs, on any soil. And it's needed any spring on soils low in total nitrogen. When these small grains start to grow in the spring, they are forming the parts of the plants that determine how much stooling there will be, how many heads there will be. When nitrogen is short, there will be less stooling, fewer heads.

Extra nitrogen is often needed by corn during the summer when the corn plants are making their greatest demands for nitrogen—from the time they are knee-high through making the ears. Then, even though the organisms are working full tilt to supply nitrogen, the needs of the corn far outstrip the supply of nitrogen.

Extra nitrogen often is needed when woody organic matter or crop residues are plowed down. As soon as this organic matter goes into the soil, soil organisms immediately rally their numbers to chew it up. And the extra population of organisms needed to work over that organic matter need nitrogen.

Extra nitrogen often raises the protein content of corn and small

grain. Because every molecule of protein takes nitrogen, the making of protein is often limited by a shortage of the nutrient. And, often, small grains and corn will run short of nitrogen when the grain is being formed. Then the amount of protein in the grain will be reduced.

Where do you get all this nitrogen? How much nitrogen do fertilizers carry? The first number in the fertilizer grade will tell you. In 3-12-12 there are 3 pounds of nitrogen in every 100 pounds; in 8-8-8, 8 pounds; in 5-20-20, 5 pounds.

Ammonium nitrate is 33-0-0. There are 33 pounds of nitrogen in every 100 pounds, with no phosphate or potash. Ammonium sulfate is about 20-0-0; calcium cyanamide, about 20-0-0; synthetic urea about 42-0-0; and anhydrous ammonia about 80-0-0.

The nitrogen in most of these fertilizers is in the nitrate or ammonia form and can be used by plants almost immediately. Nitrate nitrogen can be used by all plants without any action by soil bacteria.

Ammonia nitrogen can be used in large quantities by some crops, like rice and small grains. Other crops can use small amounts of it, but must wait until the bulk of the ammonia is changed to the nitrate form, a process that goes on rapidly in most all soils.

The nitrogen in cyanamide and urea is classed as organic nitrogen. It is in more complex form and must be worked on by soil bacteria before plants can use it in quantity.

Combinations of these various carriers of nitrogen are often used in fertilizer grades such as 8-8-8, to provide some nitrogen that is quick acting, and some nitrogen that will last until later in the season.

No one method of application will give the most efficient use of fertilizer nitrogen under all conditions. Some nitrogen in starter fertilizers placed near the seed at planting time will insure against a shortage of nitrogen when the seedlings are young, with small root systems. But when large amounts of high-nitrogen fertilizer are used in the hill or row, there is danger of burning the seedlings or injuring seed germination.

These larger amounts of fertilizer can better be broadcast and disced in, or put on plowed ground with the fertilizer attachment on the grain drill. This works all right when there is enough moisture to keep the surface layer of soil moist, so that the crops can use the nitrogen.

When fertilizer nitrogen is broadcast and plowed down, some of the nitrogen is in the upper part of the plow layer and some on the plow sole. The lower nitrogen will be in soil more likely to

be moist all during the growing season. But there is danger of loss if rain is excessive, for the water that soaks through the soil will carry some of the nitrogen down past the root zone, and out in the drainage water.

When nitrogen is put on the furrow bottom with a plow attachment, all of it is in soil most likely to be moist all during the growing season. Plants will not use that nitrogen until their roots reach down to it. This will prevent excessive growth early in the season—as there might be if all the nitrogen were in the upper plow layer near the seed. But, if there is lots of rain, some of the plow sole nitrogen may be carried down below the roots and out with the drainage waters.

Nitrogen side-dressed for corn is applied just ahead of the time the corn needs the largest amounts. By using side-dressing, you can wait for a time until you see how much the corn is likely to need. The problem with side-dressing, though, is to make sure the nitrogen is in moist soil—or that there will be enough moisture to carry the nitrogen down to the crop roots.

If you put the nitrogen down into moist soil too near the corn, you will prune the roots with the side-dresser shovel and likely do more harm by the pruning than you will do good with the nitrogen. If you put it in the middle, between the rows, you will prune fewer roots.

Top-dressing—just spreading the nitrogen on the top of the ground—at the second or third cultivation of corn will get away from the root pruning. But here again, you will be gambling that there is enough moisture to carry the nitrogen down to the roots.

Those who favor this method cite the advantage of no root pruning. They say that if there is enough moisture to make side-dressing effective, there likely will be enough to make top-dressing effective.

The nitrogen in fertilizer top-dressed on small grains in the spring doesn't run into this problem, for there usually is enough moisture at that time to carry the nitrogen to the plant roots. Too, the roots of small grains are concentrated in the surface few inches of soil, so there are plenty of feeding roots to use nitrogen at once.

The same is true of permanent pastures. When you top-dress them, there are roots in the surface and on the surface, actually, so that with the least amount of moisture the grass will be able to use the nitrogen.

Nitrogen fertilizer can be applied in irrigation waters, too. And urea nitrogen can be dissolved in water and sprayed on the leaves of apples and other fruit crops.

To use anhydrous ammonia—the most concentrated nitrogen fertilizer—you need pressure tanks. This material is condensed, by pressure, to a liquid form. When you use it, it changes back to a gas. Although it is a gas as it enters the soil, there is little loss if there is just a small amount of organic matter or clay in the soil, for the ammonia will be held by that clay or organic matter.

No soil test will tell you how much nitrogen will be available to your crops during the growing season. It will tell you how much nitrogen there is at the time the test is made, but in another week the situation may be entirely different. So the best measurement we have for soil nitrogen is an estimate based upon the amount of organic matter in the soil, the amount of manure that has been used in the past, and the number of legume crops grown.

But cold, wet weather—which slows down the bacteria—can make this estimate too high. And, too, weather may catch most of the nitrogen in dry soil where the crops can't use it. You can tell how much nitrogen your crops are actually getting by using tissue tests, then use fertilizer nitrogen to make up the lack. You can also watch for the hunger signs that show on the leaves of your crops. But remember that when these signs show, the crop is already badly starved and—most likely—yields have been cut.

Although nitrogen may be difficult to control in the soil, the management needed for the efficient use of this nutrient will pay rich dividends in higher yields and more profit. But don't forget—nitrogen alone will not work unless the other needed elements—the phosphate, potash, calcium, magnesium, and other nutrients, are in the soil or added in fertilizer in the proper balance.

CLIPPING is probably the most important single operation in keeping pastures green and succulent and in reducing weeds. Orchard grass demands repeated clippings to ensure succulent and palatable growth.

—Eastern States Cooperator

Factors Limiting Milk Production

Condensed from Guernsey Breeders' Journal

Chase C. Wilson
University of Missouri

A cow's inherited ability to produce milk, plus the feeding and management that she receives prior to and during the lactation period, have always been thought to account for the amount of milk that she produces. Certainly no one can disagree with this for it is basic and sound. However, all of us have seen cows that from all physical appearances looked to be about equal, yet one cow would way out-produce the other. How do we explain this?

Geneticists have always been inclined to lump a cow's total milk producing ability together as one. They have said that a cow either has or does not have the inherited ability for high production. This, to be sure, is true, but what are the factors that determine whether a cow does or does not have the ability for high production? To answer this question we must have a look at several basic underlying factors and see how each may contribute to or hinder milk production. Certainly, we shouldn't pass off a cow's inability to produce large amounts of milk by merely saying that she lacks the inheritance for high production.

There are many cows that are of about the same size, same general type and of similar udder conformation that are fed and handled the year around in a like manner. Yet some of these cows produce large quantities of milk, while the others are producing perhaps less than half as much milk and butter fat.

One of the factors governing this difference in production is the cow's udder. This is the real "business end" of the cow. It is here that the milk precursors are taken from the blood stream and transformed into milk. Many differences exist in these udders. First of all, if an udder is going to make large quantities of milk it must have size and capacity enough to be able to store this large amount of milk from one milking to the next. To be sure, more than just mere capacity enters the picture here because there are many large udders that secrete only small amounts of milk. The udder is made up of

Reprinted by permission from Guernsey Breeders' Journal,
Peterborough, New Hampshire, April 4, 1951

two component parts. Of prime importance are the alveoli. These are the cells that actually produce the milk and there are millions of them in the udder. There is also interstitial tissue or "meatiness" in the udder. Most of the large udders that secrete small amounts of milk are extremely "meaty." In other words, there is a preponderance of interstitial tissue with few alveoli. Even after being milked out, these udders are still large and firm. In contrast to this, many udders that are much smaller produce larger quantities of milk. These udders have a small amount of "meaty tissue" but many alveoli. When this udder is milked out, it is very soft and pliable—hanging in loose folds.

The growth of the udder's duct system and these milk secreting alveoli is induced by the hormone called mammogen. This mammogen is secreted by the anterior lobe of the pituitary gland and is poured forth into the blood stream. Most of the duct growth comes about after a young heifer starts having heat periods, whereas the major portion of the alveolar growth results after the onset of pregnancy. For a cow to be able to give a lot of milk she must have a lot of alveoli at work in her udder. She will have the maximum number at work when she is producing at her peak—usually four to six weeks after freshening. When a cow is dry these cells have all become inactive. With the decline in lactation from the peak to the dry period there is a gradual reduction in the number of working alveoli. Some cows hold up at a high level of production for a longer period of time than others. This may be due in part to a slower rate of alveolar degeneration.

After we get the proper kind of a working udder on a cow, large quantities of lactogen must be secreted. Lactogen is the hormone that stimulates the alveoli to secrete milk. It is also secreted by the anterior lobe of the pituitary gland and is poured forth into the blood stream which carries it to the udder. The amount of milk produced by a cow is a direct reflection upon the amount of lactogen secreted by the cow—if she has maximum feed and care to get the greatest amount of milk possible.

When a cow is producing heavily at her peak there is a large quantity of lactogen being secreted. As the amount of lactogen declines during the lactation period the amount of milk being produced also declines. So when we think and talk about a cow's persistency in lactation we are actually talking about her persistency in the secretion of lactogen. Thus, as the amount of lactogen being secreted decreases

the amount of milk produced also decreases.

Another factor that is vitally important in the production of milk is the secretion of thyroxine by the cow. This hormone is secreted by the thyroid gland and is extremely important in the efficiency with which a cow produces milk. It in many respects is the regulator of cell metabolism and efficiency. If all the other necessary equipment is present, it is the substance that directs food consumed by the cow into milk. It has been demonstrated that dairy cattle secrete much more thyroxine than do beef cattle. This is no doubt partly the reason for higher milk production on the part of dairy cattle than beef cattle. Thus thyroxine diverts the cow's feed into milk in the pail rather than onto the back as fat.

So if we have a low producing cow we can look to one of the following as the source of trouble —providing her feed and care are adequate:

1. Udder—growth due to mammogen.
   a. Size of udder.
   b. Ratio of milk secreting cells to amount of interstitial tissue.
   c. Persistency in maintenance of working alveoli.
2. Amount of lactogen secreted daily.
3. Persistency in the secretion of lactogen during the lactation.
4. Amount of thyroxine secreted.

The actual inheritance of these different individual factors isn't too well understood as yet, but they are direct determiners of milk production.

In this respect, a cow's total milk production can be compared to the capacity of a barrel. We can have a barrel four feet high, but if it has one short stave that is only one foot high it can hold only one foot of water. In the same token, if a cow has not received the inheritance to secrete large quantities of lactogen she will be a low producer even if she does secrete large quantities of the other needed hormones. In fact, failure to secrete an ample supply of any one of these hormones limits the cow's maximum milk producing ability even though the others are present in necessary amounts.

There have been a "few" cows that have inherited the ability to secrete maximum amounts of each one of these hormones. When they have been given the utmost in feed and care they have produced large quantities of milk and butter fat. These are the high record producing cows that are found in all breeds.

Making Grass Silage Without Molasses

Condensed from New Jersey Farm and Garden

Dr. Carl B. Bender
New Jersey Agricultural Experiment Station

FARMERS are very much disturbed about the price of molasses which they normally had been using in making grass silage of the highest feeding quality.

The molasses picture at the present moment is very much confused. Dairy men who have been putting up grass silage and using 80–100 pounds of molasses to the ton have a clear-cut understanding of the feeding value of excellent quality grass silage. But with molasses selling as high as $80 a ton, its use is quite expensive on a total digestible nutrient basis. At that price the nutrients in molasses cost more than ordinary grain feed nutrients and many farmers will feel that another preservative should be used. I think they are right in this particular thinking, even though only 7% of the cost of the molasses is lost in the ensiling process; the balance of the nutrients in the molasses is always recovered.

The next question is what substitute can be used? Corn and cob meal applied to any high moisture legume, or legume and grass combination, makes an excellent feeding silage if from 200–250 pounds of the ground corn and cob meal is applied per ton. When this grain is used as part of the preservation process, approximately 10% of the nutrients in the grain cannot be recovered in the grass silage. The balance of the nutrients increase the feeding value of the grass silage and can replace some supplemental grain in the production of milk.

Ground oats, ground wheat, or ground barley can also be used as a preservative at the same rate as corn and cob meal.

Unquestionably, many dairymen will try the wilting method of putting up grass silage. If the grass and legumes with a normal moisture content of approximately 76% are cut and allowed to wilt in the swath until the moisture content of the plant is reduced to 65%, then chopped into the silo as rapidly as the silo can be filled, silage of very good feeding quality will result.

It is difficult under average con-

Reprinted by permission from New Jersey Farm and Garden,
Sea Isle City, New Jersey, April 1951

ditions to maintain an average moisture content of approximately 65% with any degree of accuracy. Under some weather conditions the moisture content can be reduced by allowing the cut crop to wilt for two hours. At other times it will be necessary to allow it to wilt for four hours and under extremely adverse weather conditions, even 12 hours after mowing very little moisture content is lost.

Wilting the green crop to 65% moisture means that it has gone through a slight wilt. The leaves are limp and some degree of comparison can be found by comparing the feel of mowed material with the appearance and feel of the standing crop. The main point that has to be considered in handling the wilted material is that the silo be filled as rapidly as possible to exclude the air.

For greatest safety many farmers fill the silo three-quarters full of the wilted material and then finish filling with unwilted material to which they have added the required amount of preservatives.

If material that is blown into the silo is overwilted and the rate of filling is slow, frequently considerable moldy silage is the result. If the material is unwilted, when the silage is being fed it will have a very pungent odor due to the formation of butyric acid.

There is another expedient which may be used and that is if unwilted material is used, 400 pounds of dry hay may be incorporated with the chopped material. This will increase the dry matter and will result in a fairly satisfactory silage. It should be understood, however, that this dry hay should be chopped.

Many farmers this year are going to use citrus pulp as a preservative. If citrus pulp that has citrus molasses incorporated with it is used as a preservative, 150 pounds of the citrus pulp per ton of green material ensilaged will make quite a satisfactory silage.

In the making of good grass silage it is always advisable to have an air-tight silo. This is particularly true if the wilting method is used. Wherever there is air leakage, moldy spots will form in the silage and moldy silage is always a direct loss.

Quite a bit of interest has been stimulated in the sulphur dioxide method of making silage. Experimentally this has shown some promise. In using this material, operators have found that it is somewhat difficult to apply. This method needs further experimental work to determine if there is any physiological effect of feeding this silage to animals. We know that the old A.I.V. method and the phosphoric acid method of preserving silage had very definite physiological effects on the animal body, and it is possi-

ble that sulphur dioxide may have similar effects. Time alone, and experimental work, will tell. Enough is known about it now to show that it can make silage of excellent feeding quality but the same thing held true for the other acid methods.

New Highways From Old

New asphalt roads from old are made possible by a new rejuvenating process. According to J. G. Jordan, vice president, of the Shell Oil Company, the revolutionary rehabilitation method saves up to 50% in highway-repair costs, representing potential savings of millions of dollars in tax moneys. In addition, the new technique permits roads to be rebuilt speedily, without detouring, and conserves tremendous quantities of road-building materials which are becoming scarce in many areas.

The new rejuvenating method, developed jointly by Shell and Reclaimix, Inc. of Sacramento, California, can be applied on one lane of a busy road while traffic continues on the other. First, the old pavement is ripped up and tested to determine what additional components, if any, are needed to produce the desired road qualities. The broken-up pavement, which was formerly hauled away and discarded, is then fed into a mobile "road plant," where it is thoroughly pulverized and mixed with the Asphalt Softener.

At this point, additional solid components may be added if the initial test has indicated their need. Thus, Mr. Jordan pointed out, weaknesses in the original pavement and base may be corrected so that the rehabilitated road is actually better than the original was when newly built.

Finally, the rejuvenated pavement is re-laid behind the mixing machine and the lane is opened for traffic immediately.

After being field tested in the spring of 1947 at Modesto, California, the new technique was given its first full-scale trial on a public road during the summer of 1950, through the cooperation of the Highway Department of the State of California. The latter agency selected U. S. Highway 40 near Sacramento for the trial. This heavily-traveled stretch of road was not only in bad condition, but the pavement was unusually thick and tough, so that, in the words of the Assistant State Highway Engineer, Mr. Earl Whithycombe, "successful reworking of this section would ensure that anything on the State Highway System could be handled similarly." The trial stretch was reclaimed, and after proving itself under heavy and varied traffic conditions, was declared equal in every way to a brand new asphalt pavement.

Alfalfa, Queen of Forage Crops

Condensed from Better Crops With Plant Food

B. A. Brown
University of Connecticut

WHEN the land is seared by hot, dry winds and even the trees are brown with dust, what more appealing picture meets the eye than a verdant, green field of luxuriant alfalfa? Apparently drawing its food and drink from another unscorched world, this marvelous deep-rooted forage plant flourishes while others wilt and die, or at best, await better days in a dormant state.

Since Colonial days New Englanders, faced with many unfavorable conditions for growing crops, have sought kinds of plants which would produce large yields of nutritious food on infertile soils and in a wintry climate. In this search, they have been unsuccessful; but success, at a price, has attended efforts to make the soil a satisfactory medium for desirable crops. Alfalfa is a good example.

The fabulous reputation of alfalfa to produce high yields of very nutritious forage in the western states soon stimulated attempts to grow it in this region. At the Storrs Experiment Station some work was done with alfalfa before the turn of the century. In that Station's report for 1902–03, it is stated alfalfa had not been generally successful in Connecticut but that in 1902, seed had been sent to some 80 farmers for trial with the object of learning what soil and other conditions were best suited for its growth. According to the report of 1904, very little success attended those farm trials, but it was felt that alfalfa should not be ruled out until further tests had been made.

In 1914 former Agronomist W. L. Slate divided two-thirds of an acre on the old experimental field near the campus into 26 plots, each of which received a different fertilizer treatment. The purpose of that experiment was, of course, to learn how much lime, phosphoric acid, potash, and nitrogen from fertilizers or manure would be required to grow alfalfa well on the naturally acid, infertile Connecticut soils.

During the 30 years it was continued, that modest experiment yielded some important results.

Reprinted by permission from Better Crops With Plant Food, Washington, D. C., January 1951

For example, it was learned during the first few years that alfalfa would not live long without additional potash from fertilizers or manure; that if the acidity of the top few inches of soil was counteracted with lime, the alfalfa thrived and extended its roots deep into the still acid sub-soil; that response was obtained from only moderate amounts of phosphoric acid; and that the growth of this legume, like many others, was little influenced by applying carriers of nitrogen. Since those early years, many experiments and experiences have corroborated those initial findings. It should also be mentioned that some 20 years after the heavy and only liming (8 to 10 tons per acre of ground limestone) in the plow layer on some of those plots, the acidity of the sub-soil had been reduced to a depth of 36 inches. And without further liming, alfalfa continued to thrive for over a quarter of a century!

In more recent experiments, several other important soil fertility factors have been unearthed. Again, the first concerns potash and particularly the rate and frequency of application. Until about 10 years ago, it was customary to add certain amounts of fertilizers before seeding and expect alfalfa to grow through many seasons without further treatments. With lime and superphosphate, that practice was usually satisfactory; with potash, it was not. The reason for the difference is that plants absorb much more potash than they need when large available amounts of that nutrient are present in the soil. Thus, the first few crops of alfalfa after seeding get too much; the later ones too little potash. Without at least a moderate supply of potash, alfalfa soon dies. Therefore, it is now considered desirable in most cases to add potash at least once a year. It has not been very important whether the potash was added once, twice, or three times each season or whether it was supplied by fertilizers or manure. The general recommendation is to apply each year either 200 pounds of 60 per cent muriate of potash or 12 tons of well-preserved stable manure.

Another milestone was reached in 1939, when it was clearly demonstrated on the experimental plots that most of the mysterious and widespread yellowing of alfalfa during dry periods was due to a deficiency of boron. Boron is one of the so-called "minor elements" necessary in small amounts for all plants. A ton of alfalfa hay contains about an ounce of boron or, in other words, 30 pounds of boron in a million pounds of hay. Although many experiments have shown that applications of borax, which contains approximately 11 per cent boron, have not increased greatly the longevity

or yields of alfalfa in Connecticut, it seems advisable to prevent the yellowing and thereby improve both the feeding value of the hay and the morale of the farmers by adding 20 to 30 pounds of borax per acre once every four or five years. Borax is soon effective when either mixed with the soil or topdressed on the surface. Moreover, very heavy applications of lime have not been detrimental to alfalfa when accompanied by additions of borax.

On Charlton fine sandy loam soil, a common type on dairy farms, additions of the other minor elements—manganese, copper, zinc, and molybdenum—have had no effects on the stands or yields of alfalfa.

Almost from the beginning, lime has been considered a necessity for alfalfa on our acid soils. Nevertheless, continued experimentation has brought to light new facts pertaining to this old subject. Of the greatest importance, perhaps, is that lime is most efficient for legume seedlings when mixed with only the surface two or three inches of soil. A large part of plowed-under lime is positionally unavailable during the vital first few weeks of the young seedling's life. As mentioned earlier, lime gradually moves downward in the soils of this humid region and therefore one need worry little about the acidity of the subsoil if the top few inches are well limed. In general, three or four tons of ground limestone per acre are advisable for alfalfa on previously unlimed soils of the State. After the initial application, one ton per acre every four or five years will usually maintain the proper reaction.

Alfalfa grows so rapidly for a few weeks after each harvest that one gets the impression its store of nutrients and ability to flourish are inexhaustible. Such is not the case. Regardless of how well fertilized, alfalfa will die if mowed a few times when too immature. For example, two years of two "bud" stage cuttings annually reduced the stand to 27 per cent, while adjacent plots mowed when in full bloom had 71 per cent stands. The reason for such results is that during the first few weeks after cutting, the new growth of alfalfa is made largely at the expense of the nutrient reserves stored in its roots. If continually mowed when very young, those root reserves are never replenished. Many analyses of roots from alfalfa cut at various ages showed that the reserves were reduced to their lowest level about 20 days after removal of the tops. From this lowest point, the roots gradually became better fortified until a peak in reserves was reached when the tops had been growing for some 60 days. But, the first and second cutting hay from a 60-day-old growth has

such coarse stems and such a small proportion of leaves that it makes poor feed.

It was found, also, that alfalfa will remain satisfactorily vigorous if the first and second cuttings are made after 45 days of growth. In Connecticut, this usually dates the mowings in mid-June and late July.

Most rules have to be broken occasionally and usually the "45-day" rule should not be followed for the third cutting. This exception arises because 45 days from late July is mid-September and if mowed then, the tops will grow 20 to 30 days afterwards, or long enough to reduce the root reserves to a very low level just at the time when further growth of tops and, of course, strengthening of the roots are stopped by cold weather. With low root reserves, many alfalfa plants will not survive, especially during the long winter months. The practical solution of this problem is to postpone the third cutting (or grazing) until mid-October, after which there will be little new growth to weaken the roots.

Variety testing was one of the first alfalfa activities at Storrs and is still being continued. In the early years, particular attention was paid to winter hardiness and gross yields; more recently, resistance to disease and feeding quality have been recognized as important factors.

Some 15 years ago, farmers who had grown alfalfa for many years found they could not maintain their stands nearly so long as when the crop was new to their land. In 1941, while seeking the causes of such failures, a new variety test was started at Storrs on land which had grown alfalfa for many previous years. Among the 12 strains in that test were two unnamed ones, A-11 and A-136. The former was bred in Kansas, the latter in Nebraska. During 1942 and 1943, A-11 and A-136 appeared no better than most of the others. But in 1944, and especially in 1945, marked differences in stands became evident. By the end of the 1945 season, the old stand-bys, such as Grimm and Variegated, had only 23 per cent stands while A-11 was first with 93 per cent and A-136 was second with 79 per cent. The reason for these striking differences is that Grimm and Variegated are not resistant to a serious soil-born disease—bacterial wilt—while A-11 and A-136 are little affected by that trouble. Because of their resistance to wilt, these unnamed varieties not only excelled the others in longevity but also had the highest total yields for the four harvest years.

Between 1941 and 1945, the numbered varieties were named. Now they are known as "Buffalo" and "Ranger." Further tests have supported the earlier results and

either variety is recommended for fields where alfalfa has been grown before and one desires to maintain the stands for three or more years. Buffalo is preferable to Ranger, partly because of less infection with "leaf spot," a defoliating disease prevalent in humid mid-summer weather, and also because it has maintained better stands in the Storrs tests.

A few other promising varieties may be heard from later. "Narragansett" of Rhode Island origin and "Atlantic" from New Jersey are among them. It is probable these varieties are not as resistant to wilt as Buffalo and Ranger.

The most vigorous and highest yielding alfalfa during the 1947–1950 period is a variety developed at an experiment station in France. Its stems are very coarse, however, and its resistance to wilt has not been determined.

A few "creeping" varieties of alfalfa are now under test. They will be exposed to frequest cuttings to learn if they will stand grazing better than the ordinary kind.

Most of the Storrs experiments have dealt with pure seedlings of alfalfa, but some tests of mixtures have been made. As far as yields and quality are concerned, nothing has been gained by diluting alfalfa with either clovers or grasses. During dry seasons, the second cutting yields have been reduced appreciably by having any grasses in the stand.

On the other hand, the presence of grasses has reduced the heaving of alfalfa in springs following very cold winters. For this reason, it seems advisable to include some grass in alfalfa seedings on the more poorly drained soils. On very well-drained soils, however, grasses may well be omitted. When grasses are included, the present choice lies between timothy and brome. At Storrs, alfalfa-timothy mixtures have outyielded alfalfa-brome seedings.

Clovers in alfalfa mixtures have reduced the final stands of alfalfa. This is especially true of red clover which competes very strongly with alfalfa the first year and then disappears, leaving much space for seeded or volunteer grasses.

Ladino clover and alfalfa do best under such widely varying cutting or grazing systems and on such different types of soils that it appears unwise to include both in the same seeding.

Without any doubt, alfalfa is the highest yielding hay or "grass" silage crop yet grown in Connecticut. This is true whether the comparisons are based on dry matter or digestible nutrients. When one considers that these high yields may be produced on soils too sandy for other forages, during droughty as well as favorable seasons, for 5 to 10 years

without reseeding, and at an annual fertilizer cost of not over $15 per acre, the remarkable fact is the relatively small area now growing alfalfa. In recent years, some Connecticut dairymen have purchased alfalfa hay from other states at more than $50 per ton, while nearby land, capable of growing three tons per acre annually, lies practically idle. In view of this situation, will anyone deny "thar is gold in them hills?"

Record Milk Production

Cows in Dairy-Herd-Improvement Associations broke another record in 1949 when they produced an average 8,907 pounds of milk and 359 pounds of butterfat, the U. S. Department of Agriculture reports. This is an all-time high production average.

The report reflects the steady improvement that dairy association members made in the production level of their herds over many years. Cooperative cow-testing and record-keeping began in 1905. The 239 cows on test that year produced an average of 5,430 pounds of milk and 215 pounds of butterfat. By 1920, the number of cows enrolled had increased to 203,472 and their average production was 6,241 pounds of milk and 247 pounds of butterfat. In 1940, there were 676,141 cows in associations, and they produced an average of 8,133 pounds of milk and 331 pounds of butterfat.

The 1949 production average is based on a total of 943,939 cows. The number of cows enrolled in associations in 1950 has already passed the 1-million mark.

Another indication of the extent of mass herd improvement is shown by the increase in the percentage of high-producing cows. In 1926, about 45 per cent of the association cows produced less than 275 pounds of butterfat per cow and only 15 per cent produced more than 375 pounds. Now only 19 per cent produce less than 275 pounds and 39 per cent produce more than 375 pounds. The 1949 figures also show that approximately 198,000 cows in association herds, or about 21 per cent, produce more than 425 pounds of butterfat a year.

Improving dairy herds has become an old story to association members, who have followed three simple but fundamental practices through the years: (1) Culling unprofitable cows from the herd; (2) feeding the remaining cows according to their individual producing ability; and (3) selecting the best animals in the herd for breeding stock.

—Texas Farming and Citriculture

What Rent For Your Farm?

Condensed from Iowa Farm Science

John F. Timmons, I. W. Arthur, Walter E. Chryst
Iowa Agricultural Experiment Station

How to share income and expenses on a rented farm is the most important feature of the farm lease. It's also the problem which troubles landlords and tenants most.

The success of the rental arrangement often hinges upon the ability of the landlord and tenant to solve this problem satisfactorily. If the rent is too high, the tenant may have trouble living up to the agreement. He may then be forced to take one of two alternatives—either exploit the soil, or leave the farm in search of a better opportunity. If the rent is too low, the landlord may be forced to neglect the improvements or terminate the agreement. Either alternative is costly and unsatisfactory.

Only a few of the landlords and tenants interviewed in a recent survey had definite and clear ideas as to just what constitutes a "fair rent." This reflects to some extent the difficulties in determining a fair rent.

"What's customary" was the most frequent response to the question "what is a fair rent?" The next largest group answering the question, however, was those having no definite opinion. One out of ten believed that costs and expenses should be shared equally. Many of the owners and tenants believed that production should be divided in the ratio of the contributions made by each party. These contributions are hard to appraise—particularly in times of changing costs, prices and production, and with the introduction of new methods. Slightly more than one in ten said that a "fair rent" is the one the "parties agree on."

Seven factors are mentioned by landlords and tenants as highly important in working out satisfactory rents. These are (1) "what is customary," (2) other alternatives open to each party, (3) what is satisfactory to both, (4) the bargaining ability of both landlord and tenant, and (5) value of contributions made by each party, (6) productivity of contributions of each party, and (7) improvements, location, roads, markets,

Reprinted by permission from Iowa Farm Science,
Ames, Iowa, April 1951

schools, churches and other amenities.

What Is Customary

Local custom appears to be an important influence on the terms of most farm rental contracts. The influence of custom can be seen in the stability of the "customary" shares in dividing farm grains. Custom also seems to contribute to the lag in cash rents per acre as compared to the returns from share rents. Both cash and share rents seem to be influenced more by local custom than by changes in farm prices, cost and production. While custom may offer us a starting point, we need to consider other factors if rent is to reflect the changes taking place in agriculture today.

Custom tends to keep rent behind the times and results in inefficient use of agricultural resources. Also, customary rental rates may not fit the individual farm or tenant. For those adopting new farming practices, custom is of little help—arrangements for carrying out new practices may not have had time to become part of the customs of the community.

Custom, then, seems to be as much an obstacle as an aid in keeping rents fair. The formation of custom is a slow process while the other factors affecting rent change rapidly. Therefore, too much reliance can easily be placed upon "what is customary."

Alternative Opportunity

The opportunity of landlord or tenants to use their labor, capital and land resources in some other opportunity has an effect on the level of rents. Rent is the result of a supply and demand situation—the supply of land and the demand for land. The demand for land is directly related to the number of tenants. The number of tenants, in turn, may be governed by the attractiveness of non-agricultural employment and by demands of the armed services.

A prospective tenant will be reluctant to rent a farm if the expected return from the farm is less than he can earn in other employment. If non-farm alternatives are relatively better, the number of tenants will tend to be reduced, and rents may decline. On the other hand, if the tenant's rewards from farming are attractive relative to alternative opportunities, competition among tenants will tend to increase rents.

What Is Satisfactory

If rents get too far out of line either way, serious dissatisfaction may develop. The test of "reasonableness"—that is, what appears satisfactory to both landlord and tenant—is important. Satisfaction with the agreement by tenant and landlord is important to the continued success of the arrangement.

Bargaining Ability

The rent of an individual farm is affected by the bargaining abilities of the landlord and tenant. If the landlord is a skillful bargainer, the young or inexperienced tenant may pay a high rent. Again, if the landlord lives at a distant point, or is elderly or inexperienced in the farming business, the tenant may drive the better bargain. The landlord can engage a management service to do his bargaining, but most tenants at this time lack similar counsel.

This doesn't mean that rents should be uniform. The tenant with superior ability or equipment should be able to bargain for a more favorable contract than the average tenant. Likewise, the landlord offering a more productive farm should receive more than the average rent in that locality.

Value of Contributions

Many attempts have been made to arrive at a fair division of farm returns between landlord and tenant by sharing the net returns in the same proportion as the value of the contributions made by each party to the lease. According to this idea, if the annual value of the contributions of one party makes up 50 per cent of the total annual contributions, then that party would receive 50 per cent of the net returns for the year.

Here's a simple example of the application of this principle to a livestock share lease situation in which the contributions are made as follows:

Landlord's contributions	Value of annual contributions	Percent contributions
Land and buildings. Sale value $57,500 at 4 percent.....	$2,300	
One-half of breeding stock. Sale value $3,000 at 5 percent	150	
Movable equipment. Sale value $1,000 at 5 percent	50	
Subtotal of landlord's contributions	2,500	50
Tenant's contributions		
One-half of breeding stock. Sale value $3,000 at 5 percent	150	
Machinery and equipment. Sale value $11,000 at 5 percent	550	
Labor 12 months at $150 per month*	1,800	
Subtotal of tenant's contributions	2,500	50
Total contributions of landlord and tenant	$5,000	100

* Plus family living from farm.

Total value of annual contributions is $5,000—of which each party contributes 50 per cent. They agree they'll each contribute equally to management and won't charge depreciation. Therefore, net returns will be divided equally in this case.

Sales of farm land are so infrequent that it's sometimes difficult to arrive at a valuation of the farm. In that case an annual rental value of the farm could be used.

For example, suppose a landlord and tenant aren't able to

agree on a sale valuation of $57,-500 for the farm which at 4 per cent gives an annual contribution value of approximately $2,300. However, they may agree that land like this has been returning the owner about $12.50 per acre—which for 185 acres would still make an annual return to land of about $2,300. Sales of livestock and equipment are made often enough so that going values usually aren't difficult to figure on these items.

In some cases the sale value of a factor of production used in farming may not be in proportion to its productivity for farming purposes. For example, farm land near a city may have a prospective sale value for urban purposes out of proportion to its productivity as farm land. In that case the estimate of its going annual value or rental for farm land purposes could be used instead of sale value.

Productivity

The same amount of capital and labor may yield different amounts of returns in different alternative uses. For example, a certain amount of capital invested in breeding stock may yield more returns than a similar amount invested in livestock housing.

Likewise, a certain amount of capital and labor invested in corn borer control or fertilizer or weed spray may yield higher returns than the same amount invested an extra cultivation of corn.

Thus the division of net r turns on the basis of the annu value of contributions may n agree with the annual producti ity of these same contributio Some reasons for this difference net returns from alternative kin of uses to which land, labor a capital may be put include (sales values based in part on pa earnings which may lag behi current earning power of pr ductive factors (2) failure of c tomary shares to reflect curre earning power of productive fa tors (3) sales value of land bas on nonfarm uses and (4) lack knowledge of just what addition capital and labor may return various uses such as more liv stock, more improvements, fe tilizer, insect and weed contr etc.

So, it's well to keep an eye o expected productivity as well on the sale value of contributio The test of the best use of limit capital, land and labor resourc is the net returns these resourc will yield in various uses. Th problem of determining the be way to use available labor a capital may become very impor ant as shortages develop in far labor fertilizer and other ite

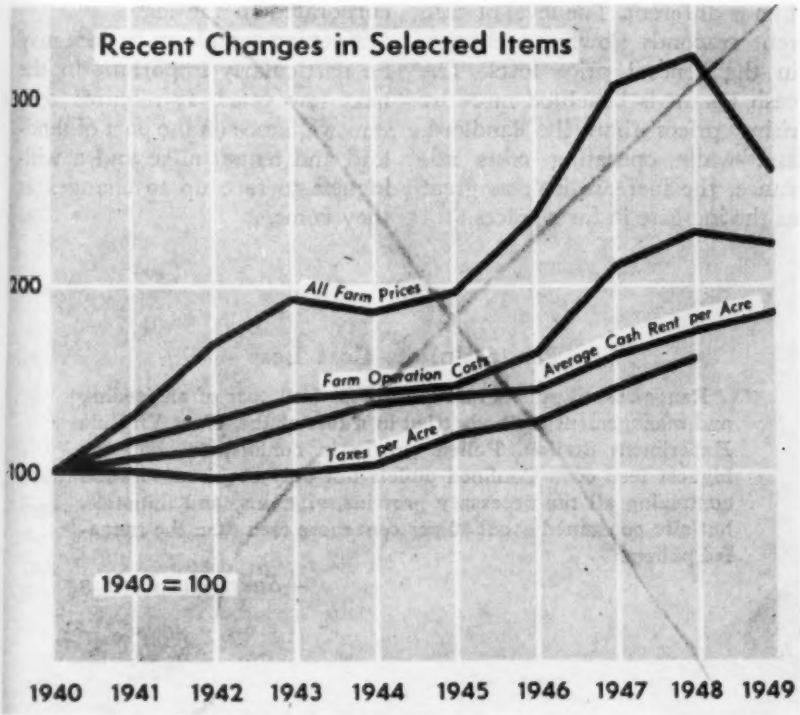
Other Factors

Improvements, location, road schools, churches and other ame

ities may or may not affect the amount of rent to be paid. For example, in some localities unimproved land will rent for the same share of the crop as an improved farm. Location of a dairy farm in a restricted city fluid milk shed may mean more rent to the owner. But location of a wheat or livestock farm adjacent to a terminal market seldom is reflected in rental rates.

Up-to-Date Rentals

After the landlord and tenant have once decided that their rental contract is satisfactory, they can't relax and forget it. A rent that's considered fair one year may not, by the same standards, be a fair rent the next year. Changes in prices, costs and production practices can alter the division of net returns. When the price level changes, specific groups of price usually change in the following order: (1) commodity prices, (2) operating costs, and (3) costs associated with land.



In line with trends shown in the graph, the landlord's net income under a stock share lease increased relative to the tenant's net income during the 1940's. The landlord has benefited along with the tenant in the matter of higher prices while his costs have lagged somewhat behind the tenant's costs. If prices were to turn downward, however, the landlord's costs would decline more slowly than the tenant's costs and his net return would decrease relative to the tenant's net return.

With the cash lease the situation is different. The level of cash rent responds slowly to changes in the general price level. The cash tenant is benefited more by rising prices than the landlord, and while operating costs advance, the increase isn't as great as the increase in farm prices.

So in a period of rising prices the net income of the cash tenant increases relative to the net income of the landlord. In a period of falling prices however, cash rents tend to remain up while the tenant's income declines more than operating costs decline and the landlord's net return increases in comparison to the tenant's net return.

It's important, therefore, that the rental agreement be examined frequently in order that corrections necessitated by price, cost and production changes can be incorporated in the lease.

Keeping rentals up to date may be particularly important in the next few years. It requires constant vigilance on the part of landlord and tenant alike and a willingness to face up to changes as they come.

Range Pullets Cost Less

Range-reared pullets had the lowest feed cost of all feeding and management methods tried in a test at the West Virginia Experiment Station. Pullets grown in confinement had the highest feed cost. Confined pullets not only required a ration containing all the necessary proteins, vitamins, and minerals, but also consumed about 10 per cent more feed than the range-fed pullets.

—*Successful Farming*

The Fly Problem

Condensed from The Jersey Bulletin

THREE distinct species of flies are major threats to the dairy farmer's income.

There is pretty good agreement that flies are a nuisance. While we often refer to flies cutting down cattle efficiency, let's not overlook the slowing down of operations they cause so far as the farmer and his hired help are concerned.

In the case of cattle, the loss is more direct. Certain flies bite and suck blood from stock, keep them from grazing while on pasture, and make them nervous and irritable in barn and barnyard. The cow that does not graze because she is disturbed by flies is not able to produce the milk she is capable of giving.

Experimental evidence shows milk production falls off from 5 to 20% during fly season, depending on the percentage of the total feed ration ordinarily supplied by pasture. The only way the herd owner can compensate for such lost production during the pasture period is through additional feeding of hay or other roughage in the barn. Here he is paying double tribute to flies, once through the cost of supplemental feed, and again through loss of use of his pasture land.

While flies that bite and disturb the cows are principally found on pasture, a small percentage of flies in the barn may also be these species. The nervous temperament of the dairy cow and her disposition to "hold up" her milk when irritated is commonly recognized. Here again, heckling by flies can cause lost time during milking and lower production, to say nothing of distress to the milking crew caused by kicking and switching of tails.

Any good dairyman will grant it is highly desirable that cows be quiet, serene, and comfortable at milking time. Only in this physical condition can milking be carried on with top efficiency. Only in pleasant surroundings will the cow eat and digest properly her grain and concentrate ration, a vital factor in milk and butterfat production. Many a cow, accustomed to a quiet barn, will refuse to give her milk and will leave grain untouched when bothered by such minor noises as clanking milk cans, loud talk or shouting. Biting, buzzing, crawling flies may likewise produce this costly nervous tension.

While we are primarily concerned with flies on the dairy

Reprinted by permission from The Jersey Bulletin,
Indianapolis, Indiana, April 10, 1951

farm, it is interesting to note the economic loss caused by flies bothering beef cattle. Comparisons have been made between groups of cattle protected by insecticidal sprays or dips and other groups in adjoining pastures with no protection. Feeder steers free of flies gained a half pound more per day than those being bitten and bothered. Calves that had been sprayed gained two-thirds of a pound more per day than unsprayed ones. It is estimated that if half the cattle in Oklahoma and Kansas alone were sprayed to protect them from flies, an annual increased beef production of 5,000,000 pounds from these states would result.

Whether milk is sold on a butter-fat or a hundred-weight basis, whether for the fluid market, the condensary or the cheese plant, the very nature of the product requires strict adherence to standards of sanitation and relative purity of the product at time of delivery to the processor.

The dairyman must take his place as producer of a top quality food and must accept sanitary responsibility. Flies are purveyors of filth. Exposed milking machine parts, milk cans, buckets, aerators, and other barn and milk house equipment are vulnerable to fly-borne infection. The fly zooms from the manure pile, the garbage pail, or the hog pen and lights on these surfaces which are to come in direct contact with milk.

In some cases, results of t transference of filth may be s in actually visible particles flo ing on the surface of the milk, as sediment in the milk. In ev case, results show up in hig bacteria counts. This may me the down-grading of milk to t point where it can no longer accepted by the processing pla It may mean the difference l tween a "Grade-A" product s at the highest market price an low-grade manufacturing mi bringing a much lower price.

It has been fairly well est lished that certain livestock d eases are often transmitted fr one animal to another, or ev from one herd to another in community, by flies. This spre of disease is ordinarily acco plished through the biting, bloo sucking flies that attack the c tle. Among the diseases known be spread in this manner are a thrax and anaplasmosis. It is a possible that bacteria responsi for mastitis, Bang's disease, a calf scours may be mechanica transmitted by flies.

From a public health stan point, the non-biting flies that i fest the barn are again potent spreaders of disease. Many hum diseases such as diphtheria, t phoid, and scarlet fever have be referred to as "milk-borne" times of epidemics. Actually, the may likely have been "fly-born

from sewage or other sources of contamination into dairy barns or milk houses, where they have been introduced into the milk.

Fortunately, modern pasteurization destroys disease germs in milk, so this feature of fly hazard is not of economic importance to the dairyman, unless he is retailing raw milk. It does have a bearing, however, on the health of his family, since they would in most cases use raw milk on the table.

Aside from loss of cattle due to diseases spread by flies, and loss of production due to interference with grazing, a severe fly infestation can extract a toll in the form of actual loss of weight and decline in physical condition in a herd.

The efficient milk cow must keep her own body weight up at the same time she transforms a large percentage of her feed into milk output. Loss of blood, nervous tension, and failure to graze all have debilitating effects on the milk cow. This is noticeable in the form of weight loss, general decline in condition of coat and clearness of eye, and consequent drop in production.

Even more noticeable are the effects on calves. Here, loss of blood is more serious with the infant calf than the mature cow. Declines in condition and vitality are more rapid and recovery, once the flies are controlled or fly season has passed, is slower.

THREE SPECIES OF FLIES

Horn Fly

Smallest of the three species of economic significance to the dairyman is the horn fly. Horn flies are a pasture problem, only rarely being found in any numbers in the barn. They spend most of their time actually on cattle when they are on pasture, biting animals and sucking their blood—and staying right on the animal while they digest their meal. Usually, they attack the backs of cattle, out of reach of the swing of the tail or toss of the head. When the air is cool, they often rest around the base of the horns—a peculiarity which has given them their name. The females lay eggs in fresh droppings. In warm weather the eggs hatch into maggots in less than a day. The maggots feed on the manure for about five days, changing into pupae and the adult fly emerging in a week or less. From egg to egg, the life cycle is about 2 weeks. The horn fly is found quite generally throughout the United States, however is not as abundant in some New England states and other sections along the Canadian border as farther south.

Stable Fly

Here is another blood-sucking fly. Much larger than the horn fly, this pest is also associated with pasture and barnyard rather than

the barn itself. It is estimated that only about 20% of the stable flies infesting a herd will follow them indoors. Unlike the horn fly, which stays on the animal between meals, the stable fly will take its fill of blood, then fly to some shady spot to rest and digest the repast. Rather than attacking the backs of cattle, stable flies customarily land on legs, flanks, or belly. Hay and straw stacks are favorite breeding spots. The female lays from three to five egg masses during her lifetime, the life cycle from egg to adult being from 18 to 21 days.

House Fly

This is the most universal of the fly species, and the most numerous. About the size of the stable fly, the house fly does not bite the cattle, as its mouth parts are built for lapping rather than biting and sucking. Around the dairy farm, house flies are the pests that frequent barn, milk house, feed room, and other indoors locations. Control of these flies is strictly for purposes of sanitation, since they are the most prolific carriers of filth and contaminators of objects on which they light of any insect. It is only among house flies that indication of "resistance" to certain insecticides have been found. In manure and other filth around dairies, the female house fly lays from three to four egg masses during her life, of from 130 to 140 eggs per mass. Life cycle from egg to adult takes abou 15 to 19 days.

Winning the Battle Against Fli

Until the end of World War I dairymen had three courses to follow in keeping their fly population at a minimum—a stri program of sanitation, screeni of doors and windows, and use certain "repellant" sprays barn walls and cattle. Some farm made use of "fly traps"—both th cone type which led flies into a enclosure from which they coul not readily fly out and the electr grid over the pan of sugar, whic electrocuted flies attempting t reach the bait. These traps wer effective only to protect a rela tively small area.

During war years, the first trul "residual" insecticides were de veloped—chemicals which no only killed flies when applied, bu which formed a deposit of mate rial on barn walls or the hides o cattle and continued to kill flie for several weeks. Some of thes residual sprays have been found to present toxic hazards to milk consumers, when used either on cattle or around dairy premises Others have been tested and are recommended by the U. S. Department of Agriculture.

Actual spraying of animals is the only effective method of controlling those flies (horn and stable flies) that pester and bite

cattle on pasture. If cattle droppings could be broken up and scattered every day, the breeding pace of the horn fly could possibly be cut down, but here again the practice is not practical. USDA-approved residual sprays today are highly effective. They should be applied at least every three to four weeks.

As has been pointed out, the primary concern inside the barn is the house fly. Since dairymen found they could control these pests with residual insecticides, investigators believe there has been too much dependence on sprays and not enough practice of sanitation. Investigations where fly "resistance" was reported have often revealed the fact that unsanitary conditions in and around the barn were providing breeding places, and that new generations of flies were being born faster than any insecticide could control them. Gutters should be kept clean, feed should be in sacks and covered bins. Residual sprays should be applied at least every six weeks, being sure that manufacturers directions are followed in mixing and applying, to insure sufficient concentration of insecticide and adequate spray on the surface being covered. Tops and bottoms of rafters, window ledges, and other protruding sections of barn construction should be sprayed as these are favorite resting places for flies.

Screens on windows and doors are still valuable fly-control instruments. Where they once were intended to keep flies out of the barn, they now serve both that purpose and the equally important function of keeping flies inside where they will receive a maximum exposure to the insecticide.

Spraying inside the barn may be so much wasted effort unless fly control is also practiced in the immediate environs, to avoid continued re-infestation. Beef barns, stables, sheds, pig pens, poultry houses, corral fences, trees, garbage cans, and other places commonly attractive to flies should be sprayed. Spreading manure two or three times a week is an ideal practice to slow down the rate of fly breeding. If this is not practical, manure may be stored on a concrete slab, surrounded by a trench filled with waste oil. House fly larvae hatching in the manure must reach soil in order to go into the pupa stage and develop into adult flies. The oil-filled trench will trap them.

Chemical Controls and Methods of Application

The first residual insecticide to gain prominence was DDT. However, in March of 1949, USDA announced that "DDT should not be used for insect control on dairy cows." The following month, manufacturers of insecticides containing DDT were advised by

USDA that: "Insecticides containing DDT should not be recommended, either directly or indirectly, for use on dairy animals, or on forage or other feeds for dairy animals, or animals being finished for slaughter," and that, "experimental work shows that when insecticides containing DDT are used as residual sprays in dairy barns, DDT often appears in the milk following such use. Until more detailed information is available that dairy barn sprays can be used without contaminating milk, all directions for use as a residual spray in dairy barns should be deleted from labeling."

The original USDA announcement declared that: "Even small amounts of DDT in a food such as milk, a universal diet especially for infants and small children, might prove harmful in time." More recently, Arnold J. Lehman of Food and Drug Administration has published a report on the toxicity of certain insecticides. In it, he points out that: "DDT can be stored at very low levels of intake; concentration in that fat is magnified from 6 to 28 times the dietary intake." Citing experiments with rats he declares that: "The continued intake of 5 parts per million of DDT in the diet produces definite but minimal liver damage." He also stated most definitely that: "Milk can become contaminated as a result of spraying barns where dairy cattle are housed."

Effective fly control chemicals, approved by USDA, are discussed below.

Methoxychlor

This was the residual insecticide suggested to replace DDT when USDA made its first announcement regarding DDT hazards. Tests have shown it may be used in the barn, on forage crops for insect control, and directly on cattle, with virtually no appearance of the insecticide in milk, or in the fat of animals. When properly applied to dairy cattle, it is given a residual rating of 21 days effective fly control. Used in the barn according to directions, its period of protection approximates 42 days.

Customary form in which methoxychlor is used is a 50% technical wettable powder. Mixed at eight pounds per 100 gallons for spraying cattle, it is necessary to apply about two quarts per cow to get sufficient material on the animal. The material sells at approximately $1 per pound, which means a cost of four cents per cow per application or about two-tenths of a cent per cow per day for fly protection.

Used as a barn spray, 32 pounds of material per 100 gallons of water is prescribed, with an application of a gallon of spray for every 500 square feet of surface. This means a cost for protection of 1.5 cents per 1,000 square feet per day.

Lindane

In July of 1949, USDA announced its recommendation of lindane (gamma isomer of BHC) as a residual insecticide for fly control in dairy barns.

First recommendation stipulated that lindane was **not to be used directly on cattle.** In December of 1949, another recommendation concerning lindane was made, stating that occasional use on cows for mange control "will not result in the appearance of appreciable amounts of lindane in the milk."

It is not recommended for fly control on dairy cattle, as this use would necessitate frequent application of the material with consequent toxic hazards, since lindane is absorbed more readily than DDT through the skin of animals. Unlike DDT, however, lindane does not tend to be stored in fat at excessive levels. Lindane is found in milk of animals sprayed with this material at quite high concentrations immediately following application, but the contamination disappears in two to three days. Lindane has been reported in brain tissues when consumed by warm-blooded animals, making it a potentially hazardous material, particularly from the standpoint of infants, consuming contaminated milk. For this reason it is urged that all milk from cows treated with lindane for mange control be thrown away during the first 48 hours following application.

Lindane is customarily sold as a 25% wettable powder. In barns the suggested rate is 10 pounds per 100 gallons of water. Indications are that the residual period of fly protection averages 21 days. Applying the spray at a gallon per 500 square feet of surface, this gives protection at the cost of about 3.6 cents per 1,000 square feet per day. For the first several days following application, lindane is noted for its rapid knock-down effect, As a barn spray, it has shown no tendency to contaminate milk, as does DDT, so long as proper precautions are used when spraying and recommended concentrations of spray used.

Pyrethrins

USDA recommendations have consistently recognized that pyrethrins, containing a synergist known as piperonyl butoxide, are entirely safe for use on dairy animals. They have a reputation for quick knock-down of flies and are at a disadvantage only due to the short period of residual protection offered. Cows must be sprayed each day to effectively control the flies. Sprays containing these products sell at about $1.75 per gallon. An ounce of spray per cow is the daily recommendation, making the daily protection cost 1.4 cents per head.

Methoxychlor-Lindane Combination

During the past years, entomologists of the Du Pont Company have worked with various state and federal investigators to perfect a combination of methoxychlor and lindane which would fall within the toxic range approved by USDA as a barn spray, and at the same time offer a better compound for fly protection of the barn than either chemical used separately. This new combination is being offered commercially to dairymen for the first time this year.

It gives both rapid clean-up of flies in the barn and residual protection up to 42 days. At about $1.35 per pound, using 32 pounds per 100 gallons of water and applying a gallon of spray per 500 square feet of surface, cost is 2.1 cents per 1,000 square feet per day for fly protection.

Because it contains lindane, this combination is not recommended for fly control applications on cattle. However, like lindane, it may be used for occasional treatment of cattle to control mange, or lice.

For Surrounding Buildings

Around hog pens, chicken houses and other locations, outside the barn and not frequented by the milking herd, DDT, BHC, and a number of other insecticides may be used to control flies. Manufacturers' recommendations on the label should be followed closely.

How to Apply

The recommended residual insecticides are nerve toxins. They produce a violent effect in the central nervous system of flies that come in contact with them. This effect is not dependent on ingestion of any of this material by the fly. For this reason, it is highly important that a good, uniform deposit of the insecticide be achieved, either on barn wall or on the hide of the animal.

Hand sprayers, in general, are not effective. Enough pressure must be applied to drive the insecticide under the hair, in the case of spraying cattle, or to plaster the material against the wall, when barns are being treated. In addition, all approved residual materials are wettable powders, which means that sprayers equipped with agitators in the spray tank are desirable, to keep chemicals in suspension. Knapsack sprayers, if used, should be upended from time to time to agitate the spray mixture.

One of the earliest methods of applying insecticides was the dipping vat. Here, cattle constantly milling through the vat keep the solution agitated. Due to the amount of chemical necessary to charge the vat, this method is

only economical when a large number of cattle are to be dipped. Drains around the vat return the splashed-out solution to the tank and it is found that the mixture may lose its potency during a day of dipping, unless more chemical is added from time to time.

Spray-dip machines, with spray nozzles past which cattle must pass and a special attachment to spray their underline, have become quite popular in the range country, because of their portable nature. While rather wasteful, they do insure that fresh insecticide is always in use.

Fogging machines have not been too satisfactory due to lack of penetration.

In spraying cattle, from 200 to 400 pounds pressure is desirable. The spray should be directed from the rear of the cow forward, to lay the insecticide on the hide, underneath the hair. While a topline spray is usually effective to control horn flies, it is necessary to spray flanks and underline if any stable flies are present. Some operators believe they get good coverage with a quart of spray per cow. However, about two quarts per animal is recommended to insure complete wetting of the animal to the run-off point. Wettable powders are preferred to oil emulsions, as they are less irritating to the hide.

In barn spraying, all feed, mangers, watering cups, and milking equipment should be covered to protect them from insecticide deposits. A gallon of spray per 500 square feet will treat most barn surfaces to the point of run-off. Barns should not be sprayed within a week after whitewashing since the insecticide will not remain effective on top of fresh whitewash. The amount of deposit visible on walls from the last spray application is no indication that the insecticide is still active, as this may be merely the inert ingredients in the wettable powder.

In general, it is felt that too many dairymen concentrate on the interior of the barn and neglect the exterior. Anyone watching flies will note that they do not ordinarily fly from some distance directly into a building. They will light briefly on the outside wall, a window casing, a nearby fence or some other resting place, then come into the barn itself. Much of the barn fly population can be reduced by spraying the outside walls and an adjacent area.

In Conclusion

Residual insecticides approved by USDA for use on dairy cattle and around dairy premises now offer the dairyman effective fly control at a cost of only a small fraction of the loss he will entail if flies are not controlled. Equally important they offer materials that have been proven safe so

far as health of the cattle, the consumers of milk and the dairyman himself are concerned. To achieve these goals, manufacturers' directions for mixing and applying should be followed to the letter, and good sanitary practices should not be neglected. Both the cattle and the barn must be sprayed to achieve good fly control. **It costs much more to support flies than to control them!**

Seed Treatment Helps Legumes

It will pay to treat legume seed before planting. Then less of this high-priced seed can be sowed an acre without reducing the stand. Oklahoma Experiment Station reports that chemicals allowed better stands, did not harm, and often helped, nodule development on legume roots. Plant disease men tested Arasan, Ceresan M, Dow 9B, Phygon and Spergon. These were used on alfalfa, Austrian winter peas, cowpeas, hairy vetch, mungbeans and yellow hop clover.

No one chemical was best for all. Ceresan M injured all seeds on which it was tried the first year and was omitted from later studies. This chemical is valuable for protecting seed of cereal grains and other crops, but the Oklahoma specialists say it is too volatile for legumes.

Percent of alfalfa seed producing plants was almost doubled when seed was dosed with Phygon and Arasan. Mungbeans gave best response to Phygon, yielding plants that were taller and healthier than seedlings from other tests. All 4 chemicals improved stands of cowpeas. Spergon gave most consistent increases in stands of yellow hop clover while vetch germinated best with Arasan. Increases for Austrian winter peas from seed treatment were not considered important.

The Oklahoma workers say chemicals and nitrogen-fixing bacteria can be applied ahead of planting without affecting nodulation. The inoculating material should be in dry form, since wetting will remove much of the chemical. Nodulation of alfalfa and cowpeas was enhanced when seed was dusted with Phygon or Arasan and then inoculated. Such seed produced more plants with nodules.

Oklahoma experience shows that excessive chemical doses tend to reduce plant stands. Spergon, Phygon and Dow 9B were most effective when applied at the rate of 1 pound of chemical for each 100 pounds of seed. Arasan was most effective at ½ pound to 100 pounds of seed. In general, seed-protecting chemicals should be used at the rate recommended on the package.

—Capper's Farmer

Death For The Gypsy Moth

Condensed from American Forests

John L. F. King

A NEW objective in man's centuries old war on insects, the complete eradication of the most damaging forest defoliator on the northeastern United States, is the goal today of an accelerating campaign.

The pest is the gypsy moth, brought from France in 1869 by a scientist in a fruitless attempt to cross it with the silkworm. It was liberated accidentally in the course of an experiment. The agent of destruction is DDT, sprayed by airplanes at rates of one-half to one pound an acre.

Massachusetts, under a county by county program initiated in Cape Cod, is leading the way. In two years nearly 650 thousand acres have been sprayed, completely protecting woodlands and brushlands of Barnstable and Plymouth counties. Together these segments of ancient Plymouth Colony comprise more than half of the hotbed of gypsy moth infestation in the United States.

Far from this hotbed, on the southeasternmost front of the penetration of the pest inland, a similar program has been carried out in Pennsylvania. First tests of DDT on gypsy moths were made there, and the results not only inspired Cape Cod's attack but have quickened the war throughout the nine-state area of infestation.

"At the end of four years, not a single living gypsy moth has been found on any part of the 315 thousand acres treated with DDT." Miles Horst, secretary of the Pennsylvania Department of Agriculture, said.

Entomologists, agriculturists and conservationists representing these nine northeastern states, meeting in Boston last year, adopted resolutions directed to the federal government and the several states and aimed at "the eradication of the gypsy moth," and urging "a completely coordinated program for gypsy moth eradication." Until then, few had been bold enough to talk eradication. Hitherto they have had to be content with control.

Several factors make that goal seem not only possible but practical. DDT, sprayed in oil, acts like an atom bomb on caterpillars. Within a minute after it hits they fall like rain from the foliage,

Reprinted by permission from American Forests,
Washington, D. C., January 1951

writhing in the death throes of paralysis. Aerial spraying of large areas costs only about one dollar an acre. Hydraulic spraying costs $25 an acre or more and ground rings cannot penetrate and spray forests.

Trapping, which costs only a cent an acre, affords practical means of detecting any colonies missed, or new infestations in sprayed areas as well as in new areas. It makes possible an efficient and economical mopping-up program for whatever time is necessary after spraying.

Two factors worry entomologists. The greatest danger is that, once the big infestations have been wiped out, men will grow careless and let the campaign drop. "Complete eradication of all infestations, whether heavy or light, is the only way we can avoid the heavy annual expense of control operations we have had in the past," Harold L. Ramsey, Chief Moth Superintendent in the Massachusetts Department of Conservation, declares.

The other factor is that of time. Insects, like all else in nature, exhibit an almost miraculous ability to build up resistance against enemies, even poisons. DDT was used with startling effectiveness against mosquitoes in Florida, but after five years they became remarkably resistant. More and more DDT is required to kill them, and as dosages are increased, other wildlife immune to light applications become susceptible. Laboratory tests with flies prove that they, too, after many generations, become practically immune.

A mere hundred dollars would have wiped out all the gypsy moth caterpillars in America immediately after the first ones escaped at Medford, Massachusetts in 1869. Leopold Trouvlot, the scientist, had put them on shrubbery to feed, covered with a cloth to prevent escape. A sudden storm whipped off the covering and spread the caterpillers about.

Well knowing the danger, the scientist appealed to the town's selectmen for aid. They refused funds. Twenty years later, when the Massachusetts General Court was forced to take action, a million dollars proved inadequate. By 1949, when "Operation Big Squirt" was initiated on Cape Cod, Massachusetts municipalities and the state had spent more than 30 million dollars in what at best were only piddling efforts at control.

In southeastern Massachusetts the pests found conditions peculiarly to their liking. Much of old Plymouth Colony had reverted to primal types of trees, including shrub oak on which the caterpillars thrived. From this hotbed the moths spread throughout New England, even into Canada.

They were found in New Jersey

in 1920; in eastern New York in 1922; an infestation approximately 1000 miles in extent was discovered in northeastern Pennsylvania in 1932, and six years later an area of some 250 square miles in the southeastern portion of the Keystone State was infested.

These advances were made despite a barrier zone erected years before in western Massachusetts, later moved into New York, in the hope of preventing invasion of the far-flung hardwood forests to the west. Federal funds were first appropriated in 1906, a costly quarantine established that still takes large annual appropriations. Creosote, arsenate of lead, imported natural enemies all were employed, and still the battle was a losing one.

Then came DDT, but with Yankee soldiers spread out over bug infested Pacific islands, the Army and the Navy held priorities. It was 1944 before the federal Division of Gypsy and Brown-Tail Moths Control could obtain enough to test it.

Tests were exhaustive. Health departments wanted to know what DDT would do to water supplies, apiarists worried about bees, the Audubon Society was concerned about birds, sportsmen about all wildlife. They argued about "nature's balances," often unmindful of the patent fact that the gypsy moth, freed of its natural enemies when it was imported, itself had destroyed a balance and become harmful to all these things, forests as well as water supplies and wildlife.

A beehive placed in a test plot was sprayed repeatedly. In the woods of J. M. Corliss, who was in charge, it "continued to be healthy and normal." Spraying up and down a trout stream, "only one per cent of the trout were killed."

Some birds died in test sprayings at five pounds to the acre. Birds were not adversely affected by strengths lethal to the caterpillars. Audubon Society observers could only conclude they benefitted through improvement of the foliage. There have been mishaps, but all experience shows that where proper precautions are observed, no material damage need be done.

Following initial tests, and with continued observation by the groups that had cooperated in them, nearly 250 thousand acres were treated in Pennsylvania and New York, and curiously enough, without attracting general attention beyond their borders. Meantime, on Cap Cod, gypsy moths were building up to one of their periodic peaks. Thousands of acres had been defoliated. The 15 towns in Barnstable County, which comprises Cap Cod, were spending upward of $40,000 a year in pest control, largely on

gypsy moths, and succeeding only in spraying roadsides.

Attractive trees and foliage are an asset, quite as much as timber, in a resort area. When Cape Cod, purely by chance, heard the first rumor of what was afoot to the west, it was interested. Inquiries brought Mr. Corliss in person to explain, and what he and his associates had to say was carried to the public in a series of newspaper articles. A Cape Cod Pest Control Committee was organized, federal, state, county and town officials were brought together in conference, and the eastern wing of a pincers movement was brought to bear on the gypsy moth.

Initial efforts were directed at two badly infested areas, each involving parts of three towns and comprising, in all, about 8000 acres. Bids were sought, a contract let, and the areas sprayed. It was a complete success except for one thing—all around the sprayed areas caterpillars fed and spun cocoons, and August showed another 8000 areas as heavily infested as had been the first.

Clearly, spot spraying could not eradicate, even properly control the pest. Covering every bit of woodland and brushland in one huge operation became the goal.

New England traditions of independence and self-sufficiency made the project a formidable one. Fifteen towns had to be united, and of them, those with the least financial resources held the largest acreages of woodland. It meant a new campaign of education, months of meetings, conferences, planning.

Finally, new legislation helped clear the hurdles. By special act of legislature, the county was authorized to appropriate funds for aerial spraying, towns were permitted to appropriate and pool such funds, and the state's chief moth superintendent was given supervision over all such aerial spraying. The Conservation Department was buttressed for all-out war. Even more, after some pressure in legislature, its funds for cooperative spraying were increased.

Spray time was near before all this was accomplished and another problem had developed. The United States Army and Air Force hold more than 22,000 acres of Cape lands in Camp Edwards and other reservations. The military had to be convinced spraying was worthwhile for it. Just when all seemed lost, there entered the conferences an Air Force entomologist who had sprayed DDT on Pacific islands. The Air Force took over.

With the ink hardly dry on the emergency legislation, bids were opened, contracts let and headquarters set up in a quonset hut on the Hyannis airport. At daybreak Monday, May 16—late but

still in time—a dozen planes took to the air.

Despite unusually favorable weather, with 27 good spraying days, the project was not entirely completed. Spraying was abruptly halted June 19 when it was found the caterpillars were going into the pupae state, in which their cocoons made them immune. There were left approximately 10,543 acres to be sprayed, or re-sprayed the following spring.

The final report, however, showed 230,923 acres sprayed at a cost, including estimated costs, of $230,728.66. Of this the county had provided $91,667.98; the towns $24,349.90 in cash and labor; the state $84,001.82, the Department of Agriculture agency an estimated $10,700 in planes, men and other aid; and the U. S. Army and Air Force spraying estimated, on the basis of costs in the rest of the country, $19,978.96. Salaries of project leaders and technical aids were not included.

Cape Cod's project paved the way, in legislation, methods and in the building of a unified, co-operative organization for what was to follow. Plymouth County took up last spring where Cape Cod had left off, financing its share of the cost through a $250,000 bond issue and spraying approximately 450 thousand acres.

Bristol and Norfolk counties remain in the hotspot. Beyond them, through Massachusetts and the other New England states, infestations are light and scattered. There is a possibility that trapping to locate colonies, followed by spot spraying, can clean these areas at greatly reduced costs.

Time, as the lawyers say, is of the essence. With eradication the goal, the longer it is postponed the greater the cost of interim control. Even greater than this, however, is the value of timber that can be saved annually. What it may be no one has been able to estimate, but studies by the Division of Gypsy and Brown-Tail Moths give some idea.

One report says: "In summarizing the damage caused by the gypsy moth in the New England states during the years 1924 to 1949, more than 7,984,725 acres were defoliated from 25 to 100 per cent, with an average annual defoliation of 307,105 acres.

"A tree defoliated 75 per cent only puts on 25 per cent of its annual growth. Oak trees growing on more than 125 thousand acres have been killed in the New England states by the gypsy moth during the past 25 years. Many trees have been killed by one year's defoliation."

The same study put a value of $26,768,254 on cordwood trees killed from 1922 to 1932, and added six million dollars to the estimated loss due to retardation of annual growth from 1911 to 1932. Nearly one and one-half

million acres of forest lands in New England were defoliated 25 to 100 per cent in 1945 and 1946.

The Interstate Committee on Gypsy Moths which met at Boston asked Congress to provide annual appropriations of one million dollars to finance, with state, county and town funds the work of eradication.

"True economy dictates eradication of this pest now," State Senator Edward C. Stone of Massachusetts, chairman of the committee, argued in Washington.

"Just as it is well nigh useless for one town, or one county to spray if its neighbors do not, so it will be if all states do not. The only way to protect the investments already made in New Jersey, in Pennsylvania, in New York, and now in southwestern Massachusetts, is to drive the gypsy moth into the sea as quickly as possible."

Fowl Leukosis Virus Isolated

Of far reaching importance to poultrymen is the announcement by Duke University, Durham, N. C., that the fowl leukosis virus has at last been isolated. It has been known for several years that a tiny virus, so small it went through the finest filters, was the cause of this disease, otherwise known as avian leukosis complex and commonly a fowl paralysis. But it had never before been isolated.

The team of workers at Duke University responsible for isolating this virus is composed of Dorothy Beard, Edward A. Eckert, T. Z. Csaky, Dr. D. Gordon Sharp, and Dr. J. W. Beard.

The virus has been identified as a type of cancer and referred to as a second cousin to the human cancer, leukemia. It has been magnified and photographed and is said to have the shape of a tadpole. It is also said to resemble the Newcastle disease virus, although it differs greatly in size and some other characteristics.

These scientists point out that the report is a preliminary one, but that the virus is now available for further biological study. Poultrymen will be glad to hear this, as this disease causes from $60,000,000 to $75,000,000 damage in poultry each year. However, the scientists caution that it is too early to predict any success in efforts to kill it or to develop a vaccine against it.

—*American Poultry Journal*

Band Seeded Legumes?

Condensed from Ohio Farm and Home Research

J. L. Haynes and L. E. Thatcher
Ohio Agricultural Experiment Station

A YEAR ago the Ohio Agricultural Experiment Station reported a newly developed seeding procedure for meadow crops, called the "band seeding method." In the band seeding method, the legume and grass seeds are concentrated above drill rows of fertilizer. Properly done, this method results in legume seedlings that grow faster and establish themselves earlier than comparable broadcast seedings. Due to reduced seedling mortality, less seed is required for good stands with the band method than is required with broadcast seedings methods. This article reviews current experience with the band seeding method and gives suggestions for improved mechanical arrangements for making band seedings.

An understanding of the principle on which the band method is based is helpful in making successful use of the method. Seedling legumes have a small area of root-soil contact. Ordinarily, they are unable to accumulate sufficient phosphorus from residual soil minerals to permit maximum rates of seedling growth. This initial handicap to the seedlings can be largely overcome by placing localized concentrations of phosphorus-bearing fertilizer where it is reached by the first seedling root. In the band method, this is done by sowing the legume seed in rows located directly above the drill rows of fertilizer with one to one and one-half inches of soil between the seed and fertilizer. With seed and fertilizer placed in this manner, the usual maintenance application of fertilizer applied in the seedbed also serves as starter fertilizer for the legume seedlings.

Band seeded legumes have a better chance than broadcast seedings for surviving the winter of the seeding year. The vigorous seedling growth of band seeded legumes enables the plants to establish relatively large root systems before the onset of winter. In first-year hay yields taken from tests at Wooster, band seedings with 500 pounds per acre of 0-20-10 fertilizer gave half again as

Reprinted by permission from Ohio Farm and Home Research, Wooster, Ohio, Jan.–Feb. 1951

much alfalfa in the hay as was obtained where the same amount of seed and fertilizer had been broadcast. This difference in yield was largely due to differences in winter survival. The improved winter survival of band seedings is of particular importance in summer seedings.

In spring meadow seedings made with oats and in seedings made without companion crop, band seedings have shown an advantage over broadcast seedings with respect to competition from weeds. This advantage is derived from the band placement whereby fertilizer is applied to all the meadow crop seed and withheld from weed seed between the drill rows.

Tests on meadow seeding rates required with the band method have not been completed. Six pounds per acre of alfalfa have been adequate for good stands in Experiment Station tests. Pending completion of more detailed studies, it is suggested that the amount of legume seed required for good stands by broadcast methods be reduced by one-third for making band seedings. For spring seedings, two pounds per acre of timothy is adequate in mixtures seeded by the band method—4 to 6 pounds are needed in spring broadcast seedings.

The most important feature of the band seeding method is placement of the meadow seed directly above the fertilizer band. Almost any mechanical arrangement that will give this seed and fertilizer placement without covering the seed or seedlings too deeply seems to give good results.

Band seedings may be made with an ordinary grain drill by attaching to the grass box seed tube extensions that are long enough to lead the meadow crop seed well to the rear of the drill disks. The seed tube extensions may be conveniently made from pieces of garden hose or other tubing that is not too rigid for necessary bending. The seed tube extensions should be arranged to drop the seed in the furrows behind the disks at a point six to eight inches to the rear of the edge of the disks.

The open end of the seed tube extension should discharge seed within two or three inches of the soil surface to confine distribution of seed to the fertilizer band. Where the legume seeds fall more than a half inch to one side of the fertilizer band the seedlings perform as unfertilized plants. Reasonable precautions must be taken against stoppage of seed flow by kinks or plugging in the seed tube extensions. A slanting cut on the discharge end of the tube is an aid to inspecting for seed flow.

During the past year, the band method was tried by many farmers in Ohio and neighboring states for seedings made in oats and for

summer seedings. In general, experiences with the method have fallen into two categories—complete success or complete failure. Most of the reported failures have been traceable to excessively deep coverage of the seed.

One type of drill is that arranged with seed tube extensions in fixed position, the support for mounting the seed tubes consisting of a board fastened to the rear platform of the drill. This, and similar mountings with seed tubes in fixed position, works satisfactorily on level land. However, drills with seed tubes in fixed posision are not satisfactory for use on steeply rolling land.

Farmers on rolling land have reported difficulties with the band seeding method that are peculiar to their topography. When operating on the contour the use of seed tubes attached to the frame of the drill do not work satisfactorily due to drifting of disks downhill from the seed rows. This results in the seed rows being placed just off the fertilizer band so that no seedling response to fertilizer is obtained. If the drill is not arranged to deliver the meadow seed directly above the fertilizer bands, attempts at band seeding will give results that are inferior to broadcast methods.

A few mechanically adept hillland farmers have rigged a seed tube support on each drill boot of their present drills so that the seed tubes float with the disks and drop the seed in furrows six or eight inches to the rear of the drill disks. These farmers have reported favorable experience with the band seeding method on hill land.

A drill arranged with seed tubes that float with the disks has proved satisfactory. With this type of seed tube arrangement, the drill rows of seed track the movements of the disks and deliver the seed directly above the fertilizer band. To avoid improper seed placement, the seed tubes should discharge at a point not higher than two inches above the disk furrow bottom when the disks are in the operating position. Drills equipped with floating seed tubes that give accurate seed placement above the fertilizer bands may be used on both level and rolling land.

Band seedings in oats. In the actual seeding operation, the oats and fertilizer are drilled in the usual manner except that the meadow seed drops in the drill rows behind the disks as described previously. The seed falling in the bottom of the disk furrows needs no covering. Chains or other covering devices are likely to bury the seed too deeply for satisfactory germination. The fertilizer (with oats) should be drilled at a depth of one to one and one-half inches below the soil surface of the drill furrows

made by the disks.

Commonly recommended grades and rates of fertilizers for oats may be used with the band method. However, where annual weeds are likely to be troublesome, nitrogen-carrying fertilizers should not be used for band seedings. Weed seedlings are benefited more than legume seedlings by nitrogen fertilizer.

As with other methods of seeding meadows in oats, the meadow seeding is favored by early harvest of the oats. For this reason, more vigorous meadow stands are obtained from meadow seedings made in early oat varieties than in late varieties. Likewise, oats planted early give better meadow stands than oats planted late in the season. Combined straw should be removed immediately after grain harvest. If it is necessary to leave oats stubble more than 12″ high, the stubble should be clipped and removed soon after harvest. A second clipping in late August is usually desirable. Where the oats can be combined to leave stubble 12″ or shorter, stubble can ordinarily be left until mid-August at which time it should be clipped and the stubble hay removed.

Band method for summer seedings. The band method has given satisfactory results when used for making summer seedings. Where, due to late seeding or early frost, there is danger of summer seedings making insufficient growth before entering the winter, the use of the band method greatly improves chances for winter survival as compared with broadcast seedings.

As with all summer seeding methods, a firm seedbed prior to making the seeding is important. The soil should be plowed well in advance of making the seeding. The final operation in seedbed fitting should be cultipacking. Preferably, the finished seedbed should be allowed to receive a good rain prior to making the actual band seeding operation. Where the seedbed is even moderately loose, the use of a cultipacker after band seeding is likely to do more harm than good due to excessively deep seed coverage.

The drill arrangement and band seeding operation for making summer seedings is the same as that described above for oats except, of course, no small grain is used. Fertilizer placement should be one to one and one-half inches below the meadow seed. As with seedings in oats, care must be observed to avoid deep coverage of the seed which should be dropped in the furrows six to eight inches to the rear of the drill disks.

For summer band seedings, customary broadcast seeding rates may be reduced. Using this method, a one-pound seeding rate for timothy in legume mixtures

is adequate and the use of more than 1½ pounds in the mixture is likely to result in too much grass in the stand. Where the band method is successfully followed (i.e. with respect to firmness of seedbed, proper seed placement above fertilizer bands, and avoidance of deep seed coverage) the use of two-thirds as much legume seed as is customarily used by broadcast seeding methods will ordinarily give adequate meadow stands. This economy of seed is perhaps the most attractive feature of the band seeding method. However, this advantage is easily lost by excessively deep seed coverage unless due care is taken in the seeding operation. On loose summer seedbeds, the danger of deep seed coverage by present means for making band seedings is so great that the use of the cultipack-broadcast-cultipack method with the use of normal seeding rates is likely to give better results than the band seeding method.

Seedings in wheat. Meadow seeding failures in wheat are more common than failures in seedings made in oats or in summer seedings. Unfortunately, no method has yet been developed for improving meadow seedings in wheat comparable to results obtained by the band method in oats and in summer seedings. The best single practice for improving chances of obtaining a good meadow stand in wheat is a light topdressing of manure during the winter.

Attempts to introduce the band seeding principle in making legume seedings in wheat have met with moderate success. Where wheat land dries out well enough to carry a drill sufficiently early for making legume seedings, it is possible to obtain a modest, but usually worthwhile benefit to legume seedling growth by drilling fertilizer with the seed. With ordinary drills, this is done by inserting the short tubes from the seed box into the fertilizer tubes. Two hundred pounds per acre of 0-12-12 or 150 to 200 pounds of 0-20-0 may be used for this purpose. This operation places the seed and fertilizer in contact in grooves cut by the drill disks—the use of more than 25 pounds of actual potash in this manner has led to germination injury in Experiment Station tests.

For the present, broadcast seedings of legumes in winter wheat made in late March or early April involve less operational hazards than running the risk of being unable to take a drill on wheat land until the season is too far advanced. On the other hand, if broadcast seedings are unavoidably delayed, seedings drilled with the starter rates of fertilizer described above should improve chances of obtaining a stand over those obtained by broadcast methods made at the same date.

Retain satisfactory seeding methods. It should be kept in mind that the principle of using fertilizers as an aid in establishing meadow seedings is a new development. With proper seed and fertilizer placement, excellent results are obtained with the band seeding method. However, like all new practices, there are "bugs" that have not been fully worked out. Agricultural engineers at the Experiment Station are now working on machinery modifications to make the method as nearly foolproof as possible. Until this work is completed, common sense should be used in changing to, and in the use of the band seeding principle. Where satisfactory seedings are already being made by other methods, and where present seeding rates are not considered excessive in cost, these tried and proved methods should be retained.

MSG Improves Poultry Meat Flavor

Poultrymen who retail their own chickens will take an interest in the experience of Eugene D. Ellis, of Miami, Fla., who tripled a 20,000-pound-a-week sales volume by injecting a seasoning agent into the dressed birds before marketing them.

He uses MSG, a centuries-old Chinese flavor-enhancer called monosodium glutamate. It has such trade names in your grocery store as Ac'cent, Zest, and Pekin Powder, and it is injected into a chicken at six or seven places. Within five minutes, it has spread uniformly, according to Mr. Ellis, and makes even a cold storage bird taste better than one cooked fresh from the yard.

The injector, which costs about $75, is the same as packers use for pickling ham except for a slightly different needle. One pound of MSG, which sells in quantity for $1.56, is enough for 500 pounds of poultry. This works out to about a cent a bird.

The Food and Drug Administration has not authorized the use of MSG for commercial dressing plants, pending further studies, but it may be worth a trial around home. It is absolutely safe for consumption, according to the manufacturers, who include International Minerals, General Mills, A. E. Staley Mfg. Co., and Huron Milling Co.

N. J. Farm & Garden

Copper Deficiency in Young Animals

Condensed from Land News

THE presence of copper in animal tissues was demonstrated early in the nineteenth century. However, for many years, scientists believed that the copper in biologic material was merely accidental and had no definite function. Early reports were confusing and conflicting. This is understandable when it is realized that older analytical methods were not particularly sensitive, and the amount of copper in living tissue is never very large. Gradually, thinking with regard to copper in the animal body was clarified, but it was not until about 1921 that copper was accepted as a definite constituent of all animal tissue.

A marked revival of interest in the copper content of the tissues of higher animals developed as the result of studies on nutritional anemia. These studies, initiated in 1924 in the laboratories of the University of Wisconsin, have revealed that copper plays an important part in the formation of hemoglobin.

The Wisconsin findings were soon confirmed, and, in addition, it was shown that insufficient copper is a contributing factor in the graying of black hair in experimental animals. In 1938, it was found that certain enzymes contain copper. These enzymes are oxidases of the type which catalyzes the reduction of molecular oxygen.

At one of the early conferences on conservation, nutrition and health conducted by Friends of the Land on the campus of Ohio University, Dr. Frank A. Gilbert of Battelle Memorial Institute, Columbus, Ohio, told the conference that sheep and cattle in certain parts of Australia had been found to be suffering from anemia and from nervous manifestations, characterized by a spastic paralysis of the hind legs. This nervous disorder, which was frequently fatal, was found to be caused by insufficient copper in the animal's feed, and could be prevented or helped by copper therapy. An examination of lambs dying from this copper-caused ataxia revealed neural lesions in that part of the spinal cord which serves the hind legs.

Apparently, in severe copper deficiency of mammals, two distinct symptoms appear: anemia and ataxis. Under laboratory conditions, the latter symptom had never been developed.

Since the time when Dr. Gilbert

Reprinted by permission from Land News,
Columbus, Ohio

addressed that early Friends of the Land conference, he and his associates at Battelle Memorial Institute have been engaged in the study of the influence of copper on the growth and development of both plants and animals.

One of these research projects was financed with funds provided by the Kennecott Copper Corporation, administered by Battelle Memorial Institute, and conducted at Hormel Institute, Austin, Minnesota, by Dr. Lawrence E. Carpenter and his assistant, Mr. Howard S. Teague who had, for some years, been experimenting with copper deficiency in pigs. Although in his early experiments Dr. Carpenter had been successful in obtaining an anemia in his pigs, he felt that purification techniques for eliminating minute traces of copper could be improved.

Dr. Gilbert has summarized these later experiments as follows:

"There was a gradual decrease of hemoglobin values even though iron was included in the diet. Increased hemoglobin formation was initiated only when both iron and copper were added to the diet. This was in accordance with the original Wisconsin findings.

However, in Dr. Carpenter's experiments an unusual leg condition developed in the copper-deficient animals. The front legs were spread at the top as though the body attachment had weakened, while the lower portion of the leg turned in, exhibiting somewhat a bowed appearance. The hind legs were abnormally crooked, and lacked rigidity. These symptoms, with some variation, gradually appeared in all of the animals. Eventually, the hind legs were drawn under and, although paralysis did not appear, the ability to use the legs as a means of body support was lost. Some animals assumed a sitting position for a period before losing the use of the front legs. By the tenth week, most of the copper-deficient pigs still alive were unable to stand.

"Outwardly, the symptoms resembled rickets. However, doubling, and in some cases tripling the vitamin A and D intake had no therapeutic effect. The forelegs and hind legs of three deficient animals, and of one control animal were X-rayed. The Roentgenograms showed no evidence of rickets in the deficient animals, but did bear out the malalignment of leg bones, which was visibly apparent.

"Samples of leg muscle tissue from deficient animals that died during the seventh week were examined histologically by Dr. W. A. Bennett of the Mayo Clinic, Rochester, Minnesota. Preliminary findings indicated a marked atrophy and degeneration of the muscle fibers, which was associated with interstitial edema. The microscopic study of many of the

body tissues is now being conducted. Iron supplements, in the absence of copper, did not prevent the further development of symptoms. The supplementation of 2 mg. of copper per day, in the absence of iron, appeared to arrest the further development of the condition, but did not have a curative effect on the existing symptoms. In all animals where copper was fed in the presence of iron, marked improvement was demonstrated. The animals that were previously unable to stand could rise, and different degrees of leg straightening occurred after ten or fourteen days of supplementation. The reversibility of the visible portion of the syndrome varied between animals, and in only one case did it progress to apparently complete recovery. One animal received iron, but no copper, throughout the experiment. By the tenth week, this pig was unable to stand. It progressed to an extreme deficiency state and died on the ninety-fourth day."

In giving this story to *The Land News,* Dr. Gilbert pointed out that the detailed Hormel findings will be published in a forthcoming number of the *Journal of Nutrition,* adding that these, in his opinion, are of great importance in that, in addition to anemia, the loss of muscular coordination and distortion of the legs have for the first time been developed in copper-deficient laboratory animals. In the original Wisconsin experiments, this syndrome did not develop.

With all the research that is now going on in Pratt Foundation, Hopkins in Virginia, in the work of the Conservation Foundation at the Massachusetts Institute of Technology, the production work on the West Coast, in addition to the greatly augumented program in the process of unfolding at Battelle Memorial Institute, we can expect much vital information to be forthcoming in the next few years.

"It is hoped," Dr. Gilbert stated in concluding his summary, "further experimentation in copper will shed much more light on the effects of its deficiency and that of other trace elements, especially in those cases of borderline deficiencies which have existed over a long period of time."

Chemical Weed Control

Condensed from American Agriculturist

John Van Geluwe

CHEMICAL weed control is becoming more and more important as labor becomes scarce and new chemicals and spray equipment are developed. The modern farmer is going to find that he will have to incorporate chemical weed control into his farming practices.

Chemical weed control has been a real boon to farmers in the wheat belt. Twenty-five million acres of crops were treated with 2,4-D in 1949. 2,4-D is probably the best known of all chemical weed killers. It is very effective in controlling broadleaved weeds and some annual grasses in corn, grains not seeded to legumes, grass pastures and hay fields. It is also effective in controlling wild onion and garlic in wheat and pastures. An acre of grain or corn can be treated with 2,4-D for as little as 40 cents. This is a very economical method of weed control.

New and improved weed killers are constantly being developed.

Beans

New water-soluble dinitros have been developed especially for pre-emergence weed control in beans and will be made available in some areas under the name "Sinox PE." These materials can be used for weeding snap, dry field and lima beans. Extensive tests have proved that these materials are very effective in controlling broad-leaved weeds for 5–6 weeks and annual grasses for 4–5 weeks after application.

Bean growers will welcome these materials, for of the 150,000–200,000 acres of dry beans grown in the Northeast, many acres are abandoned because of excessive weed growth. Field beans being a so-called "low value" crop cannot afford expensive methods of weed control, such as hand pulling or hand hoeing of weeds. With present day labor costs, water soluble dinitros fit into this picture very well. If the grower wishes to cultivate between the rows during the effective period of the pre-emergence treatment, he can apply the pre-emergence weed spray in a 12-inch band over the row only. By this method, weeds in the row are controlled by spraying during this period. Those between the rows are controlled by normal cultivation.

The spray should be applied 2 or 3 days before the beans emerge

Reprinted by permission from American Agriculturist,
Ithaca, New York, April 7, 1951

for best results. With late planted beans, this means spraying soon after planting.

Strawberries

Hand hoeing and weeding of strawberry plantings is another expensive operation. There has long been a need for a material that would successfully control weeds and grass in strawberry plantings. Sodium 2,4 dichlorophenoxyethyl sulfate, sold under the name "Crag Herbicide 1," has proved very effective in controlling weeds in strawberries. This material acts on germinating seedlings only, so it must be applied just as weed and grass seeds are germinating and before they reach ½ inch in height. A suggested practice is to cultivate the planting and then apply Crag Herbicide 1 just as the weed and grass seedlings start to germinate. This first application can be followed by subsequent applications as necessary. This material should not be applied during the harvest season.

Sweet Corn

In addition to strawberry plantings, Crag Herbicide 1 is being suggested for trial use on early maturing sweet corn varieties and on sweet corn growing on light, sandy soils. Sweet corn growing on light, sandy soil cannot safely be weeded with 2,4-D. Crag Herbicide 1 fills the need for a pre-emergence weed chemical for corn on this type of soil. From 1½ to 2 pounds per acre of this material has given excellent results.

Asparagus

Asparagus beds are notoriously weedy areas. By treating with Crag Herbicide 1 after discing and as weeds are germinating, very successful weed control has been obtained. This offers a new and effective method of weed control in asparagus beds.

Thorn Apple and Brush

Brush growing in fencerows, along roadsides and in pastures is a continual problem to farmers. In the past many laborious hours were spent in cutting and disposing of brush, only to have regrowth within a few months. In fact, cutting of thorn apple causes a continual spread of this "pest" in pastures. The development of new hormone type brush killers has been a blessing to farmers. Brush and thorn apple can be eradicated by spraying during the dormant season with a mixture of 2,4-D and 2,4,5-T.

Treated thorn apple and other brush should be left standing for at least one year to allow the materials to move down into and kill the roots. This gives permanent control of treated brush. Brush killers are especially effective in controlling thorn apple, chokecherry and poison ivy infestations.

Chemical weed control will not

completely replace cultivation. It will reduce the number of cultivations necessary and at the same time do a better job of controlling weeds that are always competing for soil moisture and nutrients. Chemical brush control has many advantages: it saves time and labor, it can be a year round operation, and it is more effective than hand cutting.

In the future as new chemicals and methods of weed control are developed, northeastern farmers will find that they must incorporate these methods into their farmings practices if they are to maintain their lead in agriculture.

How Many Litters Per Year?

Condensed from The American Hampshire Herdsman

WHICH is best, one, two, or three litters of pigs a year? That is a question which is answered in the December issue of the National Live Stock Producer. Advantages of each system are based upon conclusions resulting from a study of 40 Indiana farmers using the one-litter system, and 30 using the two-litter system.

"One-litter farmers realized a net return of $1.35 per hundred pounds of pork produced compared to a return of $1.73 for the two-litter farmers. Labor was less with the one-litter system, but the equipment and building charges were greater than for two-litter farms. Many operators had enough equipment for two-litters, but were raising only one.

"Advantages of the two-litter system were as follows: (1) Received 5% higher selling price. (2) Produced more pork on given acreage. (3) Equipment used more fully. (4) Conducive to better breeding stock selection. (5) Labor load more evenly distributed. (6) Income and market risk spread over two major market seasons. (7) Larger proportion of pork marketed as hogs rather than sows.

"Advantages of one-litter system: (1) Had 3% lower production cost. (2) Fewer management headaches; easier to keep on schedule. (3) Less capital tied up. (4) Corn storage requirements less. (5) Weather usually better at farrowing time. (6) Less hard work. (7) Bulk of corn fed in season of low corn prices. (8) Pigs big enough to hog down corn.

"Now, which system fits in with your operation? If you have plenty of labor, a small acreage,

Reprinted by permission from The American Hampshire Herdsman, Peoria, Illinois, January 1951

and a good set of buildings, fences, and equipment, you can probably use the more intensive two-litter system to better advantage. On the other hand if you have a large acreage and other enterprises with only an average swine setup, you had better stick to the one-litter plan.

"If hogs are your most profitable crop and you can't get enough volume with one litter, then the two-litter plan may be best. In the Indiana study, one-litter farmers had less labor, less equipment and perhaps less experience of interest in hog management. Those one-litter hogs are profitable and entail minimum of work. Elaborate equipment is not needed for them as the big idea is to produce them cheaply —or they will probably sell at a lower price.

"What about the three-litter system. Simply add the one-litter program to your two-litter plan for an extra summer crop. Some farmers are using this summer litter as a source of sows for their larger two-litter operations.

"Your best answer to the hog business, however, may be any of these systems. With any plan, careful management may increase returns to a far greater extent than merely changing the system itself."

For Vegetable Storage

Maybe your basement is too warm for good winter storage of fresh vegetables. If it is, you can make a convenient storage room by partitioning off a part of that basement with insulating board. The room can be cheaply built, and will be most satisfactory if placed in a corner, also with a window for ventilation in that area.

First, make a framework of 2x4's to the size of the room you wish to have, and cover both sides of these partition frames with insulating board. In this way, there will be an air space between the walls for better control of temperature in the storage area. Also apply this board to the floor and ceiling.

Then remove the panes from the window in this storage area. If there have been two panes, have a wooden flue (for passage of air) extending from one section and reaching nearly to the floor. This flue should have some control, such as a slide opening, to give less circulation on some days and lessen back drafts when necessary. Over the other window opening, place a hinged wooden cover, which can be opened for admitting air. With this combination of door opening and flue control, it is easier to keep a dry, cool atmosphere for good vegetable storage. —*Dakota Farmer*

Lipizzan Stallions of Austria

Condensed from Think Magazine

Edward Larocque Tinker

FROM the time of Genghis Khan, the man-on-horseback has been a romantic and impressive figure. Even the automobile and aeroplane have been unable to dull his lustre, as the nation-wide popularity of Gene Autry and his molasses-colored mount, "Trigger," has abundantly proved.

Even more impressive evidence of this is found in Europe in the continued existence of a school of riding and of a special breed of horses that have survived the vicissitudes of war, ruin and revolution for some four hundred years.

In the days of chivalry, the armour-clad knights needed well-trained chargers to win tournaments; and, in battle, their lives often depended on the skill and schooling of their horses. The best for the purpose came from Spain where, during the Moorish occupation, Arab and Barb stallions were imported and crossed with Andalusian mares. This produced a race with the courage, intelligence, docility and dramatic beauty of the sire, coupled with the bone, strength and substance of the dam. It is a type familiar in most of the equestrian statues of monarchs, and which Velasquez immortalized in his portrait, hanging in the Prado, of the first wife of Philip IV, Isabella de Bourbon, mounted on a gorgeous piebald.

Various European rulers founded studs to breed horses of this Spanish blood to provide mounts for the royal riding academies. The first of these schools were in Rome and Naples, and later they sprang up all over Europe. As early as 1565, money was appropriated to build a riding hall in a park in Vienna, but the name "Spanish Riding School" does not appear until twelve years later, and was given because only Spanish horses that came from a stud at the village of Lipizza, near Trieste, were used to breed from. This geographic fact made these horses come to be known as Lipizzans.

The present delightful baroque building of "The Spanish Riding Academy of Vienna," was not finished until 1735, when it was inaugurated with an exhibition of fifty-four stallions from the royal stud.

Reprinted by permission from Think Magazine,
New York, New York, December 1950

From its sixteenth-century beginning the school used only the white Lipizzan stallions. On them the sons of the royal family and the nobility were taught to ride so they would make a gallant and romantic impression on the populace as they bestrode these spectacular horses in the great parades on state occasions. The school also trained knights and sold its surplus horses as war-chargers. The docility and intelligence of these stallions made them perfect for the purpose as, added to these qualities, they had the bone and substance to carry a man full-panoplied in armor.

The academy and its priceless stud survived the French Revolution, the Napoleonic Wars, and even World War I, and remained intact, a marvelous animate legacy of the Baroque period. But the second world conflagration almost destroyed it.

Luckily the floriated riding school building was not touched by the bombing but, in 1945, Colonel Alois Podhajsky, the director, was afraid to trust his luck further, and asked permission of the Nazis to remove his horses and equipment from the city. This was curtly refused; so he obtained forty carriages and secretly arranged to hitch two Lipizzans to each and load in the saddles and tack, with the intention of smuggling them out on some dark night. This became unnecessary for, when the Russians got within eight days' march, the Germans relented and permitted the Colonel to take his beloved horses out by train to St. Martin, in upper Silesia.

After the advent of the victorious American forces, Colonel Podhajsky appealed to General Patton to protect the school and insure its survival. After the General had seen an exhibition of the horses, he not only agreed but, in addition, sent an escort and four tanks to bring the breeding sires and mares back from Czechoslovakia where they had been sent for safety in 1942.

This year the historical Spanish Riding Academy sent over fourteen of its stallions with a complement of riders to give exhibitions at the National Horse Show in New York. It was marvelous to see these noble animals go through their intricate movements—pirouette, passage, piaffe, levade, or changing lead at every other step in the canter—as if they enjoyed answering the almost imperceptible signals of their masters. It ended with a grand quadrille of eight horsemen, done with perfect rhythm and split-second precision, in time to old classical Viennese music. The statuesque beauty of the animals was enhanced by the traditional equipment of gold bridle and breastplate, with a white buckskin saddle resting on a brilliant crimson

sweat-cloth edged in broad gold galloon. The riders' seventeenth-century costume added to the picture with its brown shadbelly coat ornamented by a double row of brass buttons, skin-tight white buckskin breeches, high black jack-boots, and gold-cockaded chapeau, worn crosswise.

The graceful rhythmic movements of man and mount, fused into a single entity by years of training, and the plastic poses they assumed, made this equestrian quadrille as beautiful and as much of an art as the ballet.

Even though, to the uninitiated, all the intricate movements of the Haute École may seem mere artificial tricks, there was a practical as well as an aesthetic reason for each one. They served to make the charger more obedient and maneuverable and so enhance the rider's impressiveness in parades and his safety in battle. An excellent example is the *capriole*. When a knight was beset by enemy foot-soldiers, he could charge the ones in front, or lay about to left or right with mace or sword, but from the rear he was completely unprotected. Under these circumstances, he would give his horse the signal and it would leap into the air, lashing out at the same time with its hind feet and knocking down the varlets attacking from behind.

When I went to see the stallions, they were waiting behind the scenes for their entrance. Although nervous, high-strung, Kentucky saddle horses, mares as well as geldings, dashed back and forth within a few feet of them, the Lipizzans stood posed and quiet, although their beautiful, melting Arab eyes, alert and gentle, missed nothing that went on around them.

The Lipizzans, Colonel Podhajsky explained, were a long-lived race. One at the school was twenty-seven years old and still in active service, but that those brought over ranged from ten to nineteen years.

The Colonel was asked how long it took to train a Lipizzan. "Three to five years," he replied, "but to train a trainer may take even longer."

The School is now in Wels, in the American zone of upper Austria, with ten instructors and some sixty stallions in training. The breeding stud has about 120 mares and young entires. Today it is government-owned and practically self-supporting, as fees for riding instructions, admissions to exhibitions and the sale of surplus animals are sufficient to pay all expenses. So this venerable institution seems to have an excellent chance of surviving for many generations to come—if, God forfend, it is not called upon to cope with another world war.

Lespedeza Was Good News In 1922

Condensed from The Missouri Farmer

From a thimbleful of seed planted at the Missouri Agricultural Experiment Station in 1922 by Dr. W. C. Etheridge, a hundred million dollar crop revenue has resulted for Missouri from Korean Lespedeza. Dramatic instances have happened before, but none more so for Missouri agriculture than the story of the expansion in acreage of lespedeza on farms through the state.

In 1921, a specimen of this "wonderful weed seed" was obtained in Korea by a party who sent it to the U. S. Department of Agriculture Bureau of Plant Industry. This sample of seed was first sown at the U. S. D. A. Experiment Station at Arlington, Virginia. It grew and reproduced seed abundantly, which is the prime essential of any forage crop. But still little was known of this squatty legume, which was considered as a weed in Korea.

When this fabulous thimbleful of seed was planted in the spring by Dr. Etheridge it made lush growth during the summer months of '22. Of course, this caused a quickened interest by all concerned, but experimentation was only in the process of beginning. The matured vines were pulled up in late October, and the precious seed was threshed in a miniature threshing machine. About a pint or so of the seed was recovered, and this was carefully saved.

In the spring of '23 all of this seed was planted. It was noted that on the previous year's acreage, extensive volunteer growth of this annual plant was present, thus proving the ability of "natural reseeding." It was discovered that an enormous number of bacteria nodules were present on the last years' root systems. Ordinarily, seed of most other legumes must be inoculated, but here was a legume that quickly associated itself with nitrogen-fixing bacteria. This was called "natural inoculation," and another spoke was added to the rapidly turning wheel of Korean Lespedeza.

A sharp May frost in '23 was fatal to the clovers and it damaged the lespedeza stand, but it came back to grow on with vigor through the hot summer months. Here was a pasture crop that would stand late spring freezes, and withstand the hot dry months, which ordinarily checked the growth of all other pasture crops. In '24, a mixture of lespedeza with oats was sown to see if the two crops had an affinity. The oats

Reprinted by permission from The Missouri Farmer,
Columbia, Missouri, January 1951

were harvested for their grain, and the lespedeza was cut for hay. Experiments proved that the protein content was practically the same as alfalfa, and that stock liked this little legume, and there was very little stemmy waste to the hay.

In '25, a quarter of an acre was sown to lespedeza and two thin yearling heifers were borrowed from the animal husbandry department. The plot was fenced off, pipes were laid to furnish water, and the two heifers were weighed in. Tremendous gains were achieved, proving that as summer pasturage lespedeza surpassed all other crops grown in Missouri.

Five-pound lots of seed were sent in '27 to some 60 farmers throughout the state. Questionnaires were provided with the sample lots, so that a fairly representative account could be made of the practicability of this legume in various sectors of the state. It is needless to say that the reports were more than satisfying. From that date until now, lespedeza has spread like a tidal wave all over Missouri. It is now being grown on ten million acres of farm land, either double-cropped or in single stands. This is twice the acreage of all corn grown, and twice the combined acreage of all wheat, oats, rye, and barley being grown in the state. Estimating at a very conservative sum of ten dollars return profit from each acre of lespedeza grown, it can be ascertained that a hundred million dollar business has resulted from this chance planting in 1922.

To briefly sum up the attributes of lespedeza: it will grow on medium to poor soil, but will respond to fertile soil and soil treatments as well as any other crop; will provide succulent grazing during the summer months of July, August, September, and the first half of October, when no other pasturage will grow and produce equal feed value. It will reseed itself naturally, and will fit in nicely with crop rotation methods advocated in any balanced farming program. There are many other assets of lespedeza which are of equal importance, but which must be adapted to the individual farmer's needs.

The first bad drought in recent years was in 1932. At this time, approximately five or six thousand acres of lespedeza were in stands in Missouri. This drought proved the real worth of lespedeza on a large scale as a dry weather plant. Then, there were the droughts of '34 and '35, but by this time lespedeza had become an institution rather than an experimentation.

Since 1946 there has been a downward trend in acres established to lespedeza. A peak acreage of 10,702,440 acres was

reached in 1946 and the 1949 acreage was 10,126,455. This shift in land utilization has come about through the increased popularity of other legumes such as Ladino, Birdsfoot Trefoil, Hairy Vetch and increased acreages of land seeded to Alfalfa and Red Clover.

But, with the ever increasing menace of soil erosion, lespedeza will become a more vital asset to Missouri hill farmers. There is easily room for ten million more acres of this legume in the state. Land which now is practically waste land due to erosion and poor crop management, could well be seeded to lespedeza as the first step in reclaiming the land. It alone cannot return the soil fertility which has been mined and leached from the soil, but should be used as a link between other crops and soil treatment.

Controlling Newcastle Disease

Condensed from Poultry Tribune

Dr. C. D. Lee
Iowa State College

WHEN NEWCASTLE disease is present in a flock, it can mean high death losses. Last year, especially in the Midwest, outbreaks in young chicks varied from 10 to 90 per cent mortality. In older birds, 25 per cent was not uncommon. In one particular outbreak in a flock of pullets, the death loss was 65 per cent.

How can I tell if my flock has Newcastle disease, you ask? While an accurate diagnosis can be made only by laboratory tests, here are a few symptoms of the disease that may be helpful.

Newcastle disease symptoms vary greatly in different outbreaks, and according to the age of the birds affected. Common symptoms in young chicks are respiratory and nervous in nature. The birds gasp for air. Breathing is accompanied by a rattling sound that may be heard for some distance. Sneezing and coughing are also common. The symptoms may occur as early as five days and at any time afterward. Outbreaks in chick batteries commonly occur at five to seven days from time infection takes place, although they may occur later. The respiratory symptoms are identical with those seen

Reprinted by permission from Poultry Tribune,
Mount Morris, Illinois, April 1951

in infectious bronchitis and other diseases with respiratory symptoms.

The nervous symptoms are similar to many of those seen in nutritional deficiencies. The nervous symptoms in young birds include: Extreme excitement, partial or complete paralysis, twisted necks, inability to maintain balance, star gazers, walking in circles, tumbling, and most any describable type of nervous symptoms.

In older birds, the common symptoms are: Sneezing, coughing, and a discharge from the eyes and nostrils. These symptoms are quite similar to common colds which are of common occurrence in pullets just housed. A few cases of lameness or twisted necks may occur.

The most characteristic symptom in laying birds is a sudden drop or a complete stop in egg production. It is usually started by birds laying many floor eggs, soft-shelled eggs, off-colored shells, and irregular shaped eggs. The halt in egg production is from three to five weeks, and is characteristic of only Newcastle disease.

There is no known cure for Newcastle disease once a bird becomes infected. However, sanitation and vaccination can be used to prevent the disease.

Preventive vaccination may be used as a means of control, if used intelligently. We can expect as much and no more from Newcastle disease vaccine than we can from other vaccines as pox or laryngotracheitis.

Vaccination against Newcastle disease is not always necessary or even desirable. Vaccination is desirable only when infection is already present on the farm or on nearby premises. To vaccinate farm flocks because it is practiced in a nearby township or county is not good reasoning. It is not generally advisable to vaccinate unless the disease is active and widespread on nearby farms, or if there is a definite likelihood of the virus coming in on trucks, coops, egg cases, or used feed sacks. If farm flocks are used as supply flocks in areas where infection exists, you should vaccinate to protect egg supply at time most needed. It also will protect a hatchery against bringing virus into the incubators from eggs laid prior to symptoms. This is important to hatcherymen.

There are at present several types of killed virus vaccines available. These are mixed in various types of absorbents depending on the manufacturer. There are also live virus vaccines available from several sources.

There appears to be a great deal of argument or discussion as to the merits of the two various types of vaccine. It would appear from field experience that there is use for both, depending upon what

you want to accomplish, and whether you are raising broilers or layers.

Live virus vaccination is used on birds four to eight weeks of age or even older. If vaccination is practiced, it should be done as early as possible. It is administered by the web wing puncture, as is done in fowl pox vaccinations. Birds vaccinated with live virus develop a lasting immunity. Chicks hatched from eggs of these birds have a leftover immunity for a short period of time. This is probably much less than previously believed; in many cases immunity lasts for only one week. This same protection is afforded to chicks hatched from eggs of flocks that have gone through a natural outbreak of the disease.

There are, however, many precautions in use of live vaccine. If it is used on a laying flock, egg production is altered in a similar manner as with a natural outbreak of the disease. If birds are vaccinated when suffering with some other disease, such as coccidiosis or other infectious disease, a severe loss may occur. The vaccine should be handled with the same precaution as fowl pox or laryngotracheitis vaccine. All birds susceptible and on the same premises must be vaccinated at the same time. The vaccine may be used on one farm and cause spread to a neighboring farm, unless quarantine measures are adopted. It is believed birds are not carriers longer than six weeks after vaccination. This may not be true and some birds may be carriers for long periods.

The killed virus vaccine is also of value in controlling Newcastle disease. The vaccine is injected into the thigh or leg with a special syringe. Birds may be vaccinated at any time. If birds are in production, it does not interfere with egg production. It is not necessary to vaccinate all birds at one time. It will produce immunity for 12 weeks or more. Chicks hatched from eggs from killed virus vaccinated hens have some left over resistance to natural outbreaks. The vaccine will not spread the disease to neighborhood flocks. Birds are not carriers.

Killed virus vaccine has been used in broiler plants where chicks are brought in every week or every two weeks. Chicks can be vaccinated as early as one day of age. It can be used in a hatchery without infecting other birds as birds go from batteries to broiler plants. It will not have any ill effects on birds vaccinated when in the incubation stage of some other disease.

In areas where Newcastle has not been diagnosed and when practically all replacements are made locally each year, good sanitation without vaccination has prevented the disease from appearing.

In areas where the disease has been diagnosed, the only satisfactory way to control losses has been by preventive vaccination.

In cases where the disease was present in the laying flock during the winter and some of the birds are still on the premises, replacement chicks are vaccinated with killed virus vaccine when taken to the farm. They should be more or less isolated, as far as exposure is concerned, for at least two weeks to allow development of protective immunity. The birds are then revaccinated at 10 to 12 weeks with live virus vaccine or killed virus vaccine. In supply flocks, many use the second vaccination of killed virus vaccine when birds are blood tested for the last time.

In areas or on farms where the disease has not been present, but it is desirable to protect supply flocks, vaccination has been of two types: (1) Use of live virus vaccine by wing stab method about one month before birds come into production; or (2) use of killed virus vaccine when birds are housed or blood tested.

The live virus intranasal vaccine which is a milder strain of live virus may be used on day-old chicks. The immunity produced by intranasal vaccine is of short duration. Birds should be revaccinated in 8 to 12 weeks with live virus vaccine.

It should be remembered that vaccine "breaks" may occur when using any type of vaccine. These are due many times to vaccination of birds previously exposed, improper use of vaccine, and careless use of vaccine. In some cases, breaks occur without apparent cause. This should not discourage a vaccination program, as no vaccine for any disease is always perfect. In the products available at the present time, manufacturers have made many improvements in a short time.

If vaccination is employed correctly with a good sanitation and management program, poultrymen can expect to prevent heavy losses from Newcastle disease.

"When agriculture flourishes, all other pursuits are in full vigor; but when the ground is forced to lie barren, other occupations are almost stopped, as well by land as by sea."

—Xenophon

Birdsfoot Trefoil

Condensed from New England Homestead

Robert M. Mead

BIRDSFOOT trefoil is a drouth resistant persistent perennial legume that has existed in the east (in New York state) for many years but that has become of some national importance as a farm crop only in the last few years. Even now there is a great variety of opinion as to its value.

Its good qualities are many. It is more persistent than alfalfa and more common clovers so it is especially suited to fields or pastures that are to be kept in sod over a long period of years. Perhaps the most outstanding feature in its favor is its adaptability. It will tolerate more acid soil than alfalfa and less fertile land than the clovers although like most crops it does respond to good treatment. Because it will grow on many types of soil it may in time reclaim many upland pastures and thin soiled meadows where it is not practical to grow alfalfa or ladino. It is well regarded by beekeepers as yielding a fine quality of honey and keeping the bees busy over a longer season than the bloom of most legumes.

It makes a fine quality hay and is highly regarded for pasture because it continues to make new growth late into the summer. At present there is a continually expanding market for the seed at what seems to be an attractive price although trefoil seed production presents some difficulties.

But trefoil has its faults. Some farmers contend that they can grow more fodder in a much shorter time with the better known crops such as the alfalfa-ladino-brome combination. Trefoil does require some time to become well established. Seedings that looked like a failure the second season have often produced abundantly by the fourth or fifth year. It does not give the yield, in tons per acre, of the highly fertilized alfalfa grass combinations. The price of seed has been high and good certified seed will probably continue to be rather high. There have been many failures in initial seedings because of a lack of understanding of the plant and the proper way to seed it.

Because it is a new legume and because it does require different handling from many other

Reprinted by permission from New England Homestead,
Springfield, Massachusetts, March 24, 1951

legumes, it is recommended that most farmers try it on small plots, an acre or two, until they have a better understanding of both its seedling requirements and its crop possibilities. It may be most useful in permanent pastures and in meadows that are to remain in sod for years and should be tried with those two aims in view. It certainly should be tried on medium quality land where alfalfa has been difficult to establish.

As a seedling it does not take kindly to a heavy cover crop and for experimental seedings perhaps it is best to sow it without any cover crop at all. Also it should not be mixed with red clover or any other companion crop that is too aggressive. In areas where it is already doing well it is usually grown mixed in with such common grasses as timothy, red top or orchard grass. Any soil from sandy loam to heavy clay will do if it can be made into a good friable seed bed. Sow five or six pounds of inoculated trefoil (native certified broadleaf is best) per acre, covering very lightly. A common and satisfactory procedure is to sow the trefoil after smooth harrowing and then go over the piece with a roller. A few hundred pounds of 0-20-20 harrowed in will do for fertilizer the seedling year but after the trefoil is established it should be top dressed regularly like any other hay crop.

Good stands have been established on pasture land by harrowing up the old pasture sod in either the late fall or early spring and sowing the trefoil very early in the spring. It can be pastured the same year but should not be pastured too closely. If the old pasture sod was very poor or run out then it will require both fertilizer and lime to get a good stand of trefoil, as, while it will grow on relatively poor land, it cannot be expected to make a crop on starved run out land.

At present it seems that the use of trefoil will spread but that it will spread slowly. Perhaps twenty years from now fields yellow with trefoil bloom will be as common all over New England as they are now around Shoreham, Vt., and in some counties in New York. Trefoil self seeds quite readily so some farmers may become acquainted with it sooner than they expect if they buy hay or cattle from a trefoil producing area.

Estimating Weight Of Steers

Condensed from Farm and Home Science

Dr. James A. Bennett
Department of Animal Husbandry, Utah State College

It is highly desirable to know the weight of steers at various periods during the fattening process so that the rations can be evaluated, rate of gain calculated, or show ring classification determined. Frequently suitable scales on which to weigh animals are not readily available to many farmers. It would therefore be useful to farmers if some simple but reasonably accurate means of estimating weight based on body measurements could be devised.

In an effort to develop a suitable formula for estimating weight for steers of the beef type common to Utah, various measurements were taken on 258 steers that were exhibited at the Ogden and Salt Lake Junior Livestock shows. It was apparent that as steers grow, develop, and fatten they become taller and longer, the width and depth of body increases, and the circumference around the chest and paunch becomes larger. However, considerable variation existed among the steers of the same weight for the various measurements. Also, some measurements could be taken with more apparent accuracy than others. The one single measurement that was highly accurate and yet easily taken was the heart girth.

A suggested equation based on heart girth alone for Utah beef steers is: Live weight = 1.04 [27.5758 (heart girth in inches) – 1049.67].

The calculated live weight values for steers of certain heart girth measurements would be as follows:

Heart girth inches	Calculated live weight pounds	Heart girth inches	Calculated live weight pounds
63	715	72	973
64	744	73	1002
65	773	74	1031
66	801	75	1060
67	830	76	1088
68	859	77	1117
69	887	78	1145
70	916	79	1174
71	945	80	1203

In taking the heart girth measurement the animal should be standing with all four legs squarely under the body and with the head up in a normal position. The tape should be passed around the body just back of the shoulders at the smallest circumference

Reprinted by permission from Farm and Home Science,
Utah Agricultural Experiment Station, Logan, Utah, March 1951

and be pulled up snugly.

The formula is thought to be accurate within the range from which it was developed and for similar steers. This means that it can be applied to steers of good and choice condition that have heart girth measurements within the range of 63 to 80 inches. It will, obviously, not be applicable to steers smaller or larger in heart girth than the range specified.

The measurement data indicated that as a young steer grows and fattens he becomes larger in all respects but since the increase in size is not equal for all body measurements, it was thought that a means of estimating condition, or degree of finish, might be developed from the measurements. Height at withers is known to be a measurement of skeletal size and is only slightly influenced by environment over a short period of time such as during the fattening period. Heart girth, paunch girth, and weight on the other hand increase rapidly with deposition of flesh and are strongly influenced by the level of nutrition. Experimental results indicate that the dressing percentage is a reliable index of the amount of fat an animal's body contains. An equation for estimating dressing percentage including weight, in pounds, and height at withers, heart girth, and paunch girth in centimeters, was therefore developed and is as follows:

Dressing percent = 44.08 – .0029 (weight) – .1155 (height) + .2658 (heart girth) – .0801 (paunch girth)

This equation, though not highly accurate, provides an indirect means of estimating degree of fatness, or condition, in steers. It is definitely limited in its application for comparison purposes, however, to steers that have the same amount of "fill."

Do You Know?

The United States produces about 65 million pounds of DDT a year—75 per cent of the world's supply—and a shortage of this important chemical is feared due to extensive use and lack of ingredients.

Your Health
—Medical Society, State of Penna.

With Radioisotopes

Condensed from The Ohio Farmer

Delmer E. Groves

MANY Ohio farmers have run cooperative tests on fertilizers and crop varieties. These are set up by extension agronomists; the county agricultural agent keeps an eye on their progress. Such tests have the advantage of measuring performance under a variety of conditions and locations.

But many experiments conducted by the Ohio Agricultural Experiment Station at Wooster cannot be run in this way. Highly-trained scientists are required to conduct these elaborate tests. All conditions of the experiments must be controlled and much of the special equipment used would be far too expensive to place on various farms over the state.

An example is the research which makes use of radioactive materials. These materials are produced as a by-product of necessary atomic research and would be wasted otherwise. Radioactive materials are under continuous change. This is because they give off invisible particles called radiations.

The Geiger counter is simply an instrument which has been devised to measure these radiations. It is so sensitive to radiation that the amount of material present can be measured accurately just by using the counter. If phosphorus, for instance, is made radioactive then its presence in any part of a plant can be measured with a Geiger counter.

It is this ability to trace radioactive materials with the Geiger counter which make them so valuable for research purposes. Now it is possible to follow them with the counter and observe their passage through the tissues of the plant.

Ohio is making full use of radioisotopes in experiment station research. One of the first men in the nation to apply isotopes to farm research was J. D. Sayre, agronomist for the station, and the U. S. Department of Agriculture. He observed isotope work at the Massachusetts Institute of Technology in 1939. When Ohio State University was building the cyclotron, or atom smasher, Sayre was busy thinking up ways to use the products of this wonder machine in agricul-

Reprinted by permission from The Ohio Farmer,
Cleveland, Ohio, March 17, 1951

tural research at Wooster.

Radioisotopes are being used at Wooster to trace the course of phosphorus fertilizer through plants, in an effort to determine its most effective placement and its most available form. Other experiments test the effect of radioactive materials on living organisms (corn smut) and measure corn plants for tolerance to radioactivity. One experiment measures the distance of corn pollen travel. The entomology department has started to use radioisotopes in tracing the hibernating habits of plum curculio beetles.

It wasn't until the end of World War II that the radioisotope came into its own as a farm research tool. Some of the early work was aimed at determining its worth to boost plant growth, rather than use of the radioisotope as a research tool. Radioactive fertilizer was about to be offered to farmers with the claim that it would increase crop yields. Experiment station tests in Ohio and other states showed no extra growth response due to the radioactivity of the fertilizer.

When a material such as fertilizer is made radioactive, its path can be traced as it moves out of the soil and into plants or animals. Ohio has been cooperating with several other Corn Belt states for two years on a phosphorus project. One set of corn plots has received radioactive superphosphate (ordinary fertilizer phosphorus), one has received radioactive calcium metaphosphate, and the third received no phosphorus except what was already in the soil.

The agronomists hope to find which form of fertilizer is the best source of supply, when it is taken up by the plant, and where it accumulates in plants. By checking plant samples on the Geiger counter, they hope to get a good idea of the need for starter, plow-down and side-dress fertilizers. Results so far emphasize the need for an adequate starter fertilizer.

This experiment has turned up some unusual facts. When the plants were knee high, a fairly high percentage of the phosphorus present came from fertilizer added to the soil. This percentage decreased as the plants reached maturity. At this stage, only a small percentage of the phosphorus in the plants had come from added fertilizer. Apparently the bulk of the phosphorus had come from the soil's store or other unknown sources. This opens a new field of problems.

Another experiment is aiming at radiation injury to corn plants. Corn is planted in pots in the greenhouse. From 50 to 100 times the concentration of radioactive material normally used in the

tracer experiments is being fed to the corn plants. Even so, no injury had shown up at the end of 40 days.

Cotton was picked which was exposed at the Bikini bomb test. The genetic makeup of the plant was changed by the atomic radiation. The effect was harmful—there have been very few cases where a genetic change caused by radiation has been useful or improved plants exposed to it.

In nature, plants occasionally show up which are different from the parent plants. These are called mutations and will usually produce seed of like kind. Barley seed which was exposed at Bikini had 15 times the normal amount of mutation from the original and all were downgrades from the original plant.

Another Wooster scientist working with radioisotopes is R. S. Davidson, plant pathologist. Much of the material and equipment the station uses comes from the atomic energy center at Oak Ridge. The commission helps support the station work.

Davidson is using fungi as a tool to study possible radiation effects on living organisms. He's found that it takes a very high concentration to get much effect. His study has been with corn smut, a fungus which grows on the corn plant. Others could be used but this one is especially easy to work with. It is being grown in cultures in the laboratory in the presence of radioisotopes.

His research shows that radioisotopes can be used as tracers with no ill effects on living organisms. However, ill effects have been produced on the organisms by using much larger amounts than would ever be needed as tracers.

Sayre and Davidson are also working on an experiment to test isolation distances for hybrid corn. At present, an isolation of 40 rods is considered sufficient to prevent contamination or crossing of other varieties in the area.

A solution of radioactive phosphorus was injected into corn plants which were almost at the tasseling stage. This material always concentrates in areas of new growth and so moved to the tassels. Therefore when the plant released pollen the pollen grains contained radioactive phosphorus.

Pollen traps set at various distances from the corn plants collected pollen. By putting this pollen under the Geiger counter they were able to tell whether it came from the treated plants and thus could tell how far it traveled.

Probably the newest use of radioactivity in farm research is to help in the ceaseless fight against insect pests. Entomologist Roy Rings is working on this at the Ohio station. A reserve army officer, he spent his two weeks of

active duty at the army chemical division's medical center in Maryland last fall. This gave him opportunity to study the modern techniques being employed by army scientists in this new field.

Dr. Dale Jenkins, an Ohio State University graduate now at the army chemical center, fed radioactive phosphorus in solution to mosquitoes. When released and later collected at various points, they could be identified by use of the Geiger counter. This method is now being used to study the flight range and dispersal of mosquitoes in arctic areas. Use of this method in some western states has shown that house flies travel as far as 12 miles.

The plum curculio is a serious pest of most fruit crops. It's a tricky one to control and entomologists have never been able to find the exact spots where it spends the winter. Entomologist Rings got the idea that if he could make the beetles radioactive he could then go into the orchard during the winter with a portable Geiger counter and ferret out their hiding places.

His work so far has been concerned with treating beetles with different levels of radiophosphorus and trying out various methods for getting the material into the beetles. He's found that beetles will remain highly radioactive for periods up to five weeks and apparently behave normally during this period. Dissections of radioactive insects showed that all parts of the body, including the blood, were radioactive.

This method will be used to trace movements of insects from tree to tree or from one locality to another. It's hoped that radioactive materials will be useful in tracing parasites of insects.

Experiment station scientists have already proved that radioisotopes are valuable research tools. Their field of use is just beginning to open up. Someday they may be as indispensable as the test tube to research workers.

"It is neither wealth nor splendor but tranquillity and occupation which give happiness."

—Thomas Jefferson

Fighting Weeds With Beetles

Condensed from Farm Journal

Harold Ellis

BACK in 1945, ranchers in Humboldt County, Calif., were wondering what to do about Klamath weed. It was spreading fast on their range land.

Today, you'll have trouble finding a Klamath weed in the whole county!

Credit for its disappearance goes to a shiny green insect about the size of a ladybug. This business-like beetle refuses to eat anything but Klamath weed. In fact, it will starve before it will eat other plants.

Alert scientists spotted the beetle's particular taste for Klamath weed, and began planting beetle families where the weed was worst. Today, billions of the insects are destroying Klamath weed on nearly half a million acres of range land in 20 California counties. In Humboldt County, cattlemen consider the battle already won.

The weed is called Klamath weed in California, because it first appeared on the upper reaches of Klamath River about fifty years ago. It's known as St. Johnswort in Europe, the eastern seaboard, and in other western states (Oregon, Washington, Idaho, Montana, and Nevada).

Cattle and sheep usually pass up this poisonous weed in favor of better-tasting forage. But when feed is scarce, they start grazing the weed. Eating it causes the white-skinned portions of the body to become sensitive to sunlight. Blisters form, and the animal loses weight, gets scabby, and sore-mouthed.

Some ten or fifteen years ago, it was recognized as a threatening perennial. Chemical controls were tried, and worked fairly well. But that was expensive, and much of the mountain range was too rough for spraying, making complete eradication impossible.

About this time, scientists heard that Australia was having trouble with St. Johnswort. The Australians were trying to wipe it out with beetles imported from France. The war made it impossible for us to get any beetles from France at the time, so the Australians let us have some of theirs.

But you can't shift an insect as smart as this one from one hemisphere to another without some

Reprinted by permission from Farm Journal,
Philadelphia, Pennsylvania, April 1951

difficulties. Nature had taught the beetle to time its egg-laying with Australia's winter rains. So USDA and University of California scientists tricked the beetles by putting them under fine sprays of water at regular intervals. In a few weeks, the beetles were laying eggs.

The scientists also had to be absolutely sure that the beetle didn't have a sweet tooth for some of our valuable plants. So they ran thousands of tests on hundreds of crops. Results were convincing. Unless the beetles had St. Johnswort to chew on, they refused to eat—actually starved to death.

Late in 1945, scientists turned loose four colonies of beetles in the thickest stands of Klamath weed they could find in Humboldt County. In 1946, another half-million laboratory-raised beetles were released in 18 other California counties.

Ranchers were skeptical, but they couldn't get rid of the pest with close grazing, so they agreed to co-operate.

On the 1948 Range Improvement Tour, they had a chance to see the beetles in action. Behind the battle line, the Klamath weed was dead. In front, it was in full bloom. That convinced the ranchers. They emptied their matchboxes and filled them with beetles to start a few colonies on their own land.

In 1950, they visited the same spot and couldn't find a single Klamath weed. The beetles were gone, too. They were back in the hills somewhere, looking for more Klamath weed.

Last May, the College offered free beetles to anyone who wanted to come and get them. Farmers came by the carloads. Visitors from Washington, Oregon, and Idaho agreed that St. Johnswort is no longer a threat to the range lands of the Pacific Coast.

Lost—Seven Cows

Condensed from The Kraftsman

Frank Kohout, Jr.

WHEN my wife and I bought our farm a year ago last January and began to sell milk, we had a feeling of security. We planned how we were to pay off the mortgage. We figured how long it would be before we could say, "This farm is ours; our worries are over."

We did pretty well as beginners. Even our cows sensed our plight, and they, too, tried their

Reprinted by permission from The Kraftsman, Chicago, Illinois, Jan.–Feb. 1951

best to help us pay off the debt as fast as possible. In fact, the 12 cows averaged about 425 pounds of milk a day all summer. Then, without warning, all our hopes and inspiration were washed away.

Last Labor Day I went out as usual at 5 a.m. to call up my cows from the pasture. I opened the gate, called to the cows, and then walked on back into the barn. But on this particular morning, only 6 of my 12 cows responded to my call. It was still dark at that early hour, so I called again and waited. Still no cows came. Then, looking out towards the pasture lot in the dim light of day, I could see several cows lying near the fence. My wife and I walked out to investigate.

The animals were lying around quite close to one another. The cows were all bloated and we didn't have to be told that they were dead. We placed our hands on one of the dead animals. The body felt hard and cold, the hair was stiff, and there was no response to our touch. We didn't look at the rest for we knew they were dead also. I looked at my wife and she looked at me. I knew the same picture was passing through her mind as was through mine. Here, lying dead, were six of our best cows. What could be the matter? What would happen to our mortgage now?

We returned to the barn and called a local veterinarian. After an examination, he told us the cows had anthrax. It didn't take long for that news to spread around the community. Some of the neighbors wanted their herds vaccinated. The veterinarian returned and vaccinated the rest of my herd for anthrax. In the meantime, Dr. McDaniels, the state veterinian, heard of the presumed outbreak of anthrax and hurried to my farm.

Dr. McDaniels surveyed my herd. Then, looking up, he said, "This isn't anthrax. It's some kind of poisoning. It's too bad the herd has already been vaccinated. You're apt to lose another animal or two from the vaccination." Sure enough, the next morning another large cow died. Now I had only five of my 12 cows left. What could happen next?

While Dr. McDaniels was at my farm, he obtained a sample of blood to be analyzed at the State Laboratory. Then he told me to take a second sample together with portions of the throat and the stomach to the Physiological Laboratory at the University of Delaware. An analysis was made in my presence, and according to the pathologist, death was caused by nitrogen poisoning. The State Laboratory also reported nitrogen poisoning.

At the Physiological Laboratory we examined a portion of the stomach and the throat. The tech-

nician pointed out areas on the flesh that had been burned by the nitrogen. The hairy-like membrane on the inside of the stomach wall had been eaten away entirely. A salt-like substance found in the stomach was analyzed. It was sodium nitrate which, the technician said, killed my cows.

I didn't have any of the stuff around. Actually, I didn't know what the man was talking about. Then the technician explained. "Have you got any fertilizer around that the cows can get to?" I didn't think so. He said, "You better go home and check your premises."

After I got home, I walked out back of an old storage shed, which was located along the line fence of the pasture field. I noticed there had been a lot of licking through a small knot hole. Then I saw the picture. I recalled the former owner of the farm saying just before we were given possession, "If it's all right with you, I'm going to leave some of my tomato fertilizer in this shed. I'll put it back out of your way, and as soon as I get settled in my new place, I'll come and get it."

I had forgotten about those few bags of fertilizer. I ran around to the entrance of the shed and pulled out one. On the bag was printed "Nitrate of Soda, for plant use." I could see where the cows had stuck their tongues through the knot hole to lick the nearest bag of fertilizer.

Seven cows lost because of a knot hole! It seemed impossible. The purebreds that I had hoped to use as a basis of a registered Guernsey herd were dead and all the inspiration I had a few months before was as dead as those seven cows.

A loss of seven cows would be a set-back to any dairyman, but for a fellow who is just getting started and is trying to cut down his debts, the loss is almost a catastrophe. I intend to stick to dairying and I suppose I'll eventually acquire more cows, but the zip and enthusiasm I had a few months ago is missing. I have learned very quickly that there are great risks in farming.

Do You Know?

Three out of four traffic accidents happen in clear weather and on dry roads.

Your Health
—Medical Society, State of Penna.

No Legs—No Cow

Condensed from Holstein-Friesian World

Dr. E. S. Harrison

AMONG horsemen there is a saying of long standing, "no legs, no horse." It is time that dairymen attach the same importance to the legs and feet of dairy cattle. Conformation defects of the legs and feet are responsible for a large per cent of the foot trouble in dairy cows and a cow with sore feet or crippled legs cannot produce with maximum efficiency. Defects not only lower productive efficiency but in many cases materially shorten the productive life.

We have made little, if any, progress towards eliminating defects in leg conformation. As a matter of fact from my observations at recent shows and during farm visits I fear that leg defects are more common today than they were ten years ago.

If my observations are correct, what is the explanation? I think the answer is fairly clear cut. Selection of breeding stock and especially service sires has been based upon milk and butterfat records with little or no importance being attached to correct conformation. The worst offenders are those persons responsible for the selection of bulls for use in the artificial breeding associations. If they can obtain a positive proving on a bull they are ready to purchase him and service him to hundreds of cows without giving any consideration to the conformation of his daughters. It is time that breeders cry out in loud protest against this practice.

A comparison of production on a mere five dam-daughter pairs means absolutely nothing unless all the facts are known. Did feeding conditions provide the same productive opportunity to dams and daughters alike? What was the productive level of the dams? A bull mated to 300-pound fat dams with the daughters averaging 400 pounds of fat would be considered quite a bull. On the other hand, if a bull produced a group of 800-pound fat daughters when mated to 900-pound fat dams he would have a minus proving and be considered undesirable. The first bull would have a fat index of 500 pounds of fat and would be good enough for use only on dams with records of 500 pounds of fat or less. The second bull with the minus proving would have an index for 700 pounds of fat and would be capable of main-

Reprinted by permission from Holstein-Friesian World,
Lacona, New York, March 17, 1951

taining production on 700-pound dams.

This is another illustration of what narrow channels supposedly intelligent thinking sometimes follows. Did all of the females used in the comparison calve normally and complete a record without being handicapped by disease or any other factors? Do the daughters possess satisfactory conformation?

I realize that the exponents of the present method of proving bulls will be quick to challenge the importance of type. Some will argue that a dairyman is interested only in the amount of milk and butterfat a cow is capable of producing. Others will argue that studies on the relationship between type and production have failed to establish a significant factor of correlation.

The exponents of the theory that type is not important can be classified into two distinct groups: (1) Those who are deliberately attempting to mislead dairymen in an effort to sell semen on a wholesale basis from their so-called proved bulls. I refer to the provings that completely ignore the individuality of the daughters and the productive level of the herd on which he is to be used. (2) Those who have never milked and cared for cows and who themselves have simply been misled by all this mumbo-jumbo that type is unimportant.

The advanced registry records on classified cows have shown a very close correlation between type and production. The true importance of type and its relationship with productive usefulness, however, can only be established when lifetime records are used.

It has long been recognized that the great aged cows of the breed have seldom been sensational producing two-year-olds. They were nevertheless two-year-olds free of major defects in conformation. The record-holding early maturing two-year-olds rarely if ever attract applause as mature cows. Defects like large sloppy weakly attached udders, crooked legs and poor feet, unless extreme, do not alter the production of heifers. These defects, however, are certain to affect the lifetime performance and in the majority of cases shorten the productive life.

Every breeder also knows that besides lowering productive efficiency such defects greatly increase the amount of labor required to care for them. Did you ever sit on the floor and try to milk one of these old pendulous uddered cows or get kicked all over the place trying to treat the teats that they had crushed with their own feet? Still we have the office cowboys that insist that type is not important. Did you ever try to trim the feet of a crooked legged or spraddled toed cow as often as necessary to keep her walking

so you would not have to apologize for her? If you have I know no one could convince you that type is not important.

Inheritance is directly responsible for conformation defects of the legs and feet. Thus if a cow with poor legs is mated to a bull that is transmitting the same defects these defects are almost certain to be more pronounced in the offspring and could become serious enough to destroy or greatly lower usefulness. In contrast, if this same cow was mated to a bull that was siring good legs and feet, the odds are that the defects will be eliminated or at least partially corrected in the offspring. The same story can be repeated regarding all inherited defects in conformation. Is it not obvious then, that a breeding program based solely upon the production figures on a small number of two-year-olds is unsound?

A perfect pair of legs when viewed from the rear are set well apart and provide ample room for a wide rear udder. The legs and feet are lined up in a plane with the body which enables her to move with a smooth, easy stride. With a crooked set of legs as seen from the rear, the hocks are so close together that there is not room for the udder. The feet are far apart and set at a bad angle. A cow with such legs cannot move with a strong easy stride and the udder is pushed first one way and then the other as she walks. A cow with spread toes and weak pasterns just shuffles along on her heels and it is necessary to trim her feet from four to six times a year to keep her going at all. When a good set of legs is viewed from the side, the hock has a minimum of set and is clean cut and neatly molded. The pasterns are short and strong. When a leg has too much set to the hocks, the hock is too far out behind the cow. These are just a few of the leg defects that exist and they do not represent the extremes. Lack of care accentuates faulty leg conformation.

Even when a herd is free or practically free of leg and foot defects a certain amount of care is required to keep them in condition. Systematic care of the feet prevents good legs from growing out of shape and is absolutely essential to keep inherited defects of the legs and feet from destroying productive usefulness. With the development of the modern dairy stable and improved methods of dairying comes a great increase in the need for foot care. When the cows were turned out twice a day to make their way over frozen ground, snow and ice to the brook for a drink, they trimmed their own feet. Today with the drinking cup and heavily bedded stalls and pens there is nothing to wear the hoof down. As the hoof grows out the toes

become elevated, forcing the weight of the animal on the heel which greatly increases the strain on the hocks and pasterns. Cutting off the end of the toes does not relieve the strain because the toe remains elevated. The foot must be picked up and the sole pared down. It requires someone with a strong back to hold a big cow's foot up to permit this operation. For this reason and because of a lack of confidence in just how to do the job many cows are shamefully neglected.

We have solved this laborious task by building a home made foot trimming rack. This rack reduces the danger of personal injury as well as animal injury to a minimum, eliminates most of the back breaking labor and permits a thorough and complete job.

We trim all our heifers' feet as a routine practice as they leave the calf barn. Failure to do this could easily be responsible for serious leg and foot trouble at a future date.

Where severe winter conditions greatly restrict the amount of exercise cows get from January to the middle of March, the feet should be trimmed before turning out. If cows are turned out without trimming their feet, a certain percent of them will break the toes off short enough to cause serious lameness and a loss of production.

Five-Year Tests Show How to Get Best Hay

What's the best way to put up a crop of alfalfa to get the most feed out of it?

Five years of tests at Beltsville show that you'll save more nutrients by making wilted grass silage, or by barn-drying, than you will if you let the hay cure in the field.

Rain-damaged, field-cured hay takes the most work and ties up your equipment longest. Wilted silage and barn-drying are next—but they don't take much more time and work than putting up field-cured hay that escapes the rain.

If you want to judge roughage by its protein, wilted silage is out front with 20% protein. The barn-dried hay is next with about 18½%, and field-cured hay is last—18% if it doesn't get rained on, and 17% if it does.

When it comes to carotene—the alfalfa silage.

The Bureau folks explain that when you cut the grain to less than 500 to 550 pounds during the first 8 or 9 months, the heifers can't eat enough alfalfa to get the energy they need to grow.

—Farm Journal

Cane Fruits For Home Gardens

Condensed from Flower Grower

George L. Slate
New York State Agricultural Experiment Station

THE gardener who wishes to produce the greatest quantity of fruit with the least amount of effort should consider the brambles—raspberries and blackberries. They bear a light crop the second year, but a full crop a year later and annual crops thereafter for the duration of the planting. The plants are inexpensive, and you can also propagate your own stock after getting started.

The big advantage of these fruits is the relative ease of controlling insects and diseases as compared with the difficult, expensive and messy job of applying several sprays each year to fruit trees. The berries often need *no* spraying, but if it is necessary it may be done with a hand sprayer or duster.

Brambles start fruiting in July, near the end of the strawberry season, and continue well into August. In late August or early September, the new autumn-fruiting or so-called everbearing raspberries begin ripening and continue until stopped by a hard frost—which may be as late as mid-October in many locations.

Raspberries thrive best in the cooler regions, and in general are not happy south of Washington, D. C., and the Ohio River Valley, except at higher elevations. A few varieties may be grown as far south as Virginia, and plant breeders at the North Carolina and Tennessee experiment stations have introduced varieties adapted to their particular latitudes.

September, a new red raspberry, deserves special mention for the home gardener as it bears two crops each year. The summer crop ripens very early, about July 1 in central New York, while the fall crop begins about September 1 and continues until frost. Altogether, September produces fruit for eight to ten weeks. It also will perform satisfactorily farther south than many other red varieties. The quality of the summer crop is fair but that of the fall crop much better.

To supplement the early summer crop of September, several later-ripening, one-crop varieties are available. Milton is one of the best, but Taylor, Newburgh and

Reprinted by permission from Flower Grower,
New York, New York, February 1951

Latham are popular with many. The latter is suited to a wide range of conditions and is one of the hardiest varieties. South of Washington, D. C., Sunrise may be grown.

In the northern half of New England, Durham, a new autumn-fruiting raspberry variety, starts ripening its fall crop about a week earlier than September. Indian Summer, the most widely grown fall-bearing variety, is inferior to September as it is much later and often inclined to crumble. West Coast gardeners should try Willamette and Washington. These two and Milton are good for freezing. Amber is a new, very large, late-ripening variety of high quality and great vigor that is worth trying in the garden; its name indicates its color.

Black raspberries, often called blackcaps, are richly flavored and excellent for jam as well as canning and dessert, although their seeds are annoying. Bristol and Dundee are two of the best varieties, but Cumberland, New Logan, Morrison and Evans are also good.

Black raspberries are not as easy to grow as the red varieties, chiefly because of their susceptibility to various diseases. None of the black varieties is resistant to mosaic, a virus disease which is often present in wild raspberries found in fence rows, waste land or in run-out garden plantings. To grow the black caps successfully, only virus-free inspected plants from reliable sources should be planted and they should be at least several hundred feet from any raspberry which might harbor mosaic.

Another disease, verticillium wilt or blue stem, is often present in soils where tomatoes, peppers, eggplants and potatoes have been grown within two or three years. This rules out vegetable gardens as suitable sites for the black varieties, but since the disease does not move far in the soil the berries may be planted a few yards from soils which may be infected with this disease.

Purple raspberries are hybrids between the black and red varieties. They manifest this in great vigor and heavy crops of berries of great usefulness in the kitchen. Sodus and Marion are two of the best. In spite of its apparent good health, the Columbian variety is a virus carrier and should be grown only by itself.

Blackberries ripen near the end of the raspberry season and extend to mid-August. But unfortunately in recent years it has been difficult, in fact well nigh impossible, to secure a good variety from nurseries; hence very few are now being planted. Yet at its best, the blackberry is a delicious fruit well worth a place in the home garden. This year two new varieties, Bailey and Hedrick, resulting from the blackberry

breeding project at the New York State Agricultural Experiment Station, are being introduced for trial. Both have performed well under test at Geneva and elsewhere and home gardeners will find them worth trying.

The boysenberry and youngberry are actually trailing blackberries, which are suitable for culture in the milder sections of the country. On the West Coast and south of Washington, D. C., they are useful in the garden for their large high quality berries. In the northern states winter protection is necessary.

The brambles, being a semipermanent feature, should be planted to one side of the garden, in full sun and well away from the roots of large trees. A well-drained soil of at least moderate fertility is essential. Organic matter should be provided in advance of planting either by applying stable manure or plowing under a heavy sod. Quack grass and other perennial weeds must be eliminated before the berries are planted as it is impossible to clean them out of an established planting.

Good air circulation is desirable to lessen injury from fungous diseases, especially anthracnose of the black and spur blight of the red varieties. Airy sites on slopes are not as cold in winter as low spots surrounded by higher ground.

Good planting stock is half the battle in getting cane fruits off to a good start. The plants should be purchased from nurseries that specialize in small fruits, or at least pay considerable attention to them. With the brambles it is essential that only virus-free plants be set, and this means getting inspected stock from nurseries or growers. Plants from an old runout garden planting should not be used unless you know that they are disease-free. They should be ordered promptly to make sure that the desired varieties are still available, and varieties should be specified and not left to the discretion of the nursery.

The one-year or sucker plants of the red raspberries and blackberries are better than two-year plants which are expected to fruit the first year. Brambles should not be allowed to bear any fruit the first summer, as any crop will be very light and at the expense of cane growth that is to fruit a year later. One-year plants of the black and purple raspberry varieties are rather delicate and if they are to be shipped any distance the two-year plants may be preferable.

Either spring or fall planting is satisfactory, but spring planting must be done as early as possible since brambles are among the first plants to start growth. Late spring plantings often encounter hot dry weather and are likely to fail.

The plants are set behind the spade or in a furrow, taking care to step heavily on the soil each side of the plant. The important part of any planting job is to have the soil packed firmly against the roots tight enough so that the plants will resist a firm tug without loosening. The canes at planting time are cut back to a height of about 8 inches.

Red raspberries and blackberries, both of which produce suckers freely, are best grown in narrow hedge rows about a foot wide with all suckers outside of this strip promptly removed along with the weeds. They should not be allowed to spread all over the place in unkempt thickets as often happens in gardens. Some grow them in hills to facilitate cross cultivation, but yields per unit of area are lower and staking is expensive. Spacing at planting time is about 2 feet in the row and 7 to 9 feet between the rows. The black and purple varieties produce no suckers and may be set 3 to 4 feet apart in the row.

Support is often provided either by a wire trellis, or stakes if in hills. It is doubtful whether the berries kept out of the mud will pay for the extra labor and cost of support. The fall crop of September should be tied up, however, as it is heavy and drags in the soil or is bruised by whipping wind. Two ties should be made, one below the cluster and the other in it; otherwise the cane may break just below the fruit.

Summer care is mainly a matter of weed control, either by cultivation or with a mulch. Cultivation should be as shallow as possible and often enough to eliminate the weeds. After August 1, especially with a fruiting bed, cultivation should be discontinued and a cover crop sown, or the weeds allowed to grow. Rye, ryegrass, oats and buckwheat are suitable. During the fall the cover crop competes with the raspberries for the available plant food and moisture, thus checking their growth so that the canes will mature and be less inclined to winterkill. This is especially important in rich soils, or where stable or poultry manure has been used freely. Home gardeners are sometimes inclined to use too much manure, if it is available, and lush growth of the raspberry canes is easily winterkilled.

It is impossible to be very positive in recommending fertilizers for brambles as soils and their previous management vary greatly from garden to garden. In many soils, or where stable or poultry raspberry canes are making six feet of growth, it is doubtful whether greater cane growth would be of much advantage. In soils of low fertility, though, manure is always useful and may be applied at the rate of three bush-

els to 100 square feet, or ten tons per acre. If manure is not available, a complete commercial fertilizer of a 10-10-10 formula may be applied at the rate of one pound to 100 square feet in the spring as growth starts. The fertilizer application may be increased or decreased according to cane growth. Generally, large dark green leaves indicate that a plant is making satisfactory growth.

The brambles must be pruned regularly or they will soon make a dense unmanageable thicket of little use for fruit production. Bramble canes are biennial, that is, they grow one year, fruit the next year and then die. As soon as the crop is harvested the canes which bore it are cut out. This may be done at any time from the end of harvest until the following spring, but the planting is tidier and there may be some benefit from the standpoint of insect and disease control if it is done immediately.

In the spring, before growth starts, the canes of the red raspberries which grew the previous season are cut back about one-fourth and the weaker ones are removed, leaving the row about a foot wide with the canes spaced about 6 inches apart. The canes of the black and purple varieties are usually branched and the branches are cut back to about 8 inches for the black varieties and 10 to 12 inches for the purple sorts. Blackberry laterals are left about 15 to 18 inches in length. The weaker canes are removed, leaving six or seven strong canes to each hill.

In June the new shoots of the black raspberries reach a height of 18 inches and the tips are pinched off to make the canes branch. Purple raspberry shoots are topped at about 2 feet and blackberry canes at 3 feet. Canes, unless topped, grow very long and unmanageable. The red raspberry canes should not be topped.

If you are thinking of growing fruit in your garden, give considerable thought to the brambles. They are easy to grow and provide a lot of eating enjoyment.

"Let the farmer forevermore be honored in his calling, for they who labor in the earth are the chosen people of God."

—Thomas Jefferson

Irrigation—5 HP Style

Condensed from Electricity On The Farm

Herbert Jonas

You can lift a lot of water and irrigate a good sized piece of ground with a 5-horsepower electric motor.

If you pump from a ditch, a creek or a well, where there is little lift, you may be able to handle up to 40 acres. A 5-HP electric motor, hooked to a centrifugal pump, will produce a good flow if your water source is within 15 feet of ground level.

Just how much land you can irrigate with a 5-HP installation depends on your water supply. Friction loss in your pipe line, type of soil, and the kind of crops grown should also be considered. You'll want to discuss these factors with your Power Company farm representative, your county agent or soil conservation district supervisor and your pump dealer before you buy equipment.

The job a 5-HP outfit will do also depends on whether you use surface or sprinkler-type irrigation. You'll need more water, and consequently irrigate less land, if you rely on surface irrigation.

Your first cost will be greater if you install a sprinkler system. However, you will find your water supply will go twice as far on sloping land. There will be less soil erosion. You may be faced with a land leveling job if you try surface, or rill-type irrigation. But, if you install a sprinkler system, you won't be bothered by slopes, humps, or swales. The overhead sprinklers distribute water evenly, without run-off. Land, level enough for average farming, is level enough to irrigate with a sprinkler system.

There are farmers in the Sunnyside district of Yakima valley, Washington, who now irrigate with a 5-HP electric motor and sprinkler system. And they get a better job than when they used a 25-HP gasoline engine to pump for rill-type irrigation. Cases like this, of course, are extreme. The 25-HP gasoline engines were put in use before farmers paid much attention to the hydraulics of irrigation. The new 5-HP electric installations are tailored for the job. The importance of careful engineering when you put in an irrigation system can not be over emphasized.

By rule of thumb, a 5-HP electric motor will do a better pumping job than a 7½-HP gasoline

Reprinted by permission from Electricity On The Farm,
New York, New York, March 1951

engine. The electric motor will handle temporary overloads that would throw a gasoline engine off the line. In addition to being easier to start and requiring little attention, an electric pumping installation usually costs less to operate. Pump men figure a gasoline engine takes a pint of gasoline per HP per hour of operation.

You might not think it necessary to irrigate pasture that gets from 75 to 80 inches of annual rainfall. Douglas Messinger does, and he makes it pay! Dry pasture once caused a drop in milk production at the Messinger farm. The 5-HP electric motor and sprinkler system have corrected this.

Messinger has a dairy farm near Astoria, on the Oregon coast. He put in a sprinkler system to keep 30 acres of pasture green during summer months when rainfall is slack. A 5-HP electric motor and pump lift creek water 10 feet and distribute it on clover, oat grass and ladino clover pasture. The 17 sprinklers put three inches of water on an acre in 12 hours. Messinger covers two acres a day with his irrigation system. He gets over the pasture once each two weeks. This applies six inches of supplemental water each month during June, July, August and September.

It looked like a calamity when a drainage project near Toppenish, Washington, lowered the water table that had been sub-irrigating S. E. Schaeffler's natural meadow. But, the way things turned out, Schaeffler says it is one of the best things that ever happened to him. He brought in a dragline and struck water about three feet under the ground surface. He dug a pond 16 feet deep and 25 feet in diameter. Then he bought a 5-HP electric motor, a 2½-inch centrifugal pump, and put in a sprinkler system. He seeded what had been natural meadow with a mixture of orchard grass, smooth brome, red clover and birdsfoot trefoil. Where the natural meadow had forage for one Aberdeen Angus to the acre, the seeded pasture provides for four head of cattle.

Schaeffler uses the sprinkler system on 40 acres of alfalfa and pasture. He has 1,220 feet of 6-inch main line pipe. There are 16 sprinklers, with ¼-inch nozzles and $\frac{3}{16}$-inch spreaders on 1,000 feet of 3-inch lateral. Each sprinkler throws a 100-foot circle of water and puts one-half inch of water on the ground in an hour. Schaeffler put in big sprinklers so he could get over the ground faster. He moves the lateral line after eight hours. The outfit is capable of covering the 40 acres in five days of continuous operation.

The big sprinklers aren't so good for new seeding. However, Schaeffler gets around that by

soaking the ground before he seeds. If he finds the ground is packed too hard, he goes over it with a harrow to loosen the top half-inch of soil.

Schaeffler irrigates alfalfa after each cutting. He puts the water on while the growth is low, and then quits. He thinks he may lose a little tonnage with a single irrigation (he gets an average of six tons to the acre) but he figures he gets better hay with more feed value.

The pasture on the Schaeffler place is cross-fenced. The best five-acre piece will carry 30 head of beef for six weeks. The cattle come off when the grass has been grazed down to about four inches. Schaeffler then clips the pasture with a mower, leaves the clippings for a mulch, and brings in the sprinklers. After the pasture is soaked up, it stands idle for from 2 to 3 weeks until the grass gets 8 to 10 inches of growth.

The big advantage Schaeffler finds in sprinkler irrigation is that he can control the amount of water he puts on. With rill-type irrigation, part of the land would get too much water, some not enough.

A 5-HP electric motor and sprinkler irrigation system simplified the job of seeding pasture on 20 acres of new land for A. K. Morrow and Archie Maples, sheepmen of Yakima Valley, Washington. Water was available at gravity flow from the Bureau of Reclamation's Roza project canal. The two men cleared sagebrush by hitching tractors to each end of a 10-foot railroad rail and dragging it across the land. Electric pumping and the sprinkler system distributed water evenly over ridges and swales. No time or expense was required for land leveling. The 20 acres were seeded with a pasture mix of clover and orchard grass.

Water is put on the 20 acres of land with a 1½-inch centrifugal pump at 35 pounds pressure through 1,200 feet of 4-inch main line and 620 feet of 3-inch lateral. This irrigation system puts out 125 gallons of water per minute. It has 16 sprinklers, each of which throw a 98-foot circle of water. The sprinklers, which run day and night from June through September, are moved to a new location each 12 hours. It takes 14 moves and seven days to put three inches of water on 20 acres of pasture. The pasture, which takes care of sheep that can't go to summer range in the mountains, is cross-fenced and used on a rotation basis. One pasture area is grazed, while the second is irrigated. The third area lies idle to recover growth after watering.

Electric pumping and sprinkling brought a number of benefits to Morrow and Maples. They got a better stand of pasture from the seeding because of even water

distribution. Erosion has been checked. There is more grazing area because of the fact that no space is wasted for ditches and rills.

Four Cuttings Instead of One

Albert G. Bunn, RFD 4, The Dalles, Oregon, has 12 acres of heavy clay loam soil. It was once an old lake bottom. There was only enough rain for one good stand of alfalfa and a skimpy second cutting.

Bunn dug out a spring on the place to make a pond 30 feet wide, 60 feet long and five feet deep. He bought an electric motor and pump and started irrigating. Four acres, still in alfalfa, now yield four good cuttings each year. The remaining eight acres are rotated, half in tomatoes and half in cover crop.

Bunn has put his own ideas in this rill-type irrigation system. He lifts water about seven feet from the pond with a 2-inch centrifugal pump. It is driven by a 5-hp electric motor. Because his water needs vary, he changes the pulley size on the motor to get either 120 gallons per minute, or 60 gallons per minute from the pump.

The pump is at a high point on the land, so that water is carried by gravity in a portable line made from 20-foot sections of quick-coupling 3-inch pipe. He bored ⅝-inch holes in the pipe to match spacing of 450-foot long rills. Instead of using valves in the pipe, Bunn regulates water with plugs made from old-fashioned clothes pins. A wood wedge placed in the clothes pin fork regulates the flow from the ⅝-inch opening. Pushed clear in, the base of the clothes pin closes the hole and shuts off the water. Bunn has found the clothes pin plugs are easier and less expensive to replace than are metal valves damaged in pipe moving and hauling.

Electric pumping may increase the value of your crops. But, no two pumping installations are alike. It will pay you to take your irrigation problem to an expert.

Super-Pastures

Condensed from Cappers Farmer

Ralph L. Foster

SUPER is the word for Clay county improved pastures. It describes high-protein legume-grass mixtures—the kind that make 400 to 600 pounds of beef an acre. Super-pastures mean something over and above ordinary bluegrass.

Clay county stockmen have long been proud of their bluegrass. They learned to improve its quality with lespedeza and white clover. They held on to their grass acreage, even under pressure of war production. They had a deep-rooted conviction that they could make their greatest food contribution with beef. Their rolling hills were not meant to be torn and gutted with row crops. They were made for grass and cattle.

It was only a short step from bluegrass and lespedeza to brome and alfalfa. The doctrine of lime and phosphate was willingly accepted. Ladino was welcomed with open arms. And birdsfoot trefoil will get a fair trial.

Missouri's Balanced Farming program and organization of a soil conservation district have accelerated Clay county's super-pasture planting. Phrases like Balanced Farming, Proper Land Use, and Soil Conservation, meant something. They sounded like more grass to grass-conscious men. The Millers—Frank, the county extension agent, and John, district soil conservationist—get good reception when they talk their programs.

Planting of super-pastures is spreading around several community demonstrations. Here and there over the county men like I. A. Lowry, T. S. Moffett, and A. C. Reinking had taken the lead in seeding the high-producing grass and legume mixtures. Now plantings are counted by the dozens. John Miller says 15,000 acres of super-pasture have been established since the soil conservation district was organized.

Super-pasture is as good as 80-bushel corn land, says S. J. Barr. He and his father used to grow corn and feed cattle. But not any more. It is easier to put the big gains on with brome and alfalfa. The forage carries lots of protein and is ready-mixed. Barr sells cattle off grass or gives them a short feed, depending on what the

Reprinted by permission from Cappers Farmer,
Topeka, Kansas, April 1951

market wants.

Reinking, with 600 acres of grass, grows no corn. "Our grass-fat cattle may not have the quality of dry-lot stuff, but we have lots of customers for the kind we produce," he says. "Besides, with the gains we get from grass and the protection we have for our land, we can't afford to grow corn. If we need corn we call on farmers down along the Missouri river."

Two pounds a head a day seems to be the standard beef gain on Clay county super-pastures. T. S. Moffett says he gets 400 pounds of gain an acre from a season of grazing. His mixture of orchard grass and ladino clover on 200 acres carries a steer to the acre for 6 months. Gains on his limed and phosphated bluegrass total about 125 pounds an acre a year.

It is little wonder that Barr rates his pasture equal to 80-bushel corn land. On 46 acres of brome-alfalfa 163 head of big cattle gained 2 pounds a head daily from April 20 to July 15. That figures out better than 600 pounds of beef gain an acre. He also had 100 hogs on the pasture. After he took off the stock he cut 35 tons of hay from the field.

Lespedeza is still a midsummer standby for Barr. He has 40 acres in a mixture of lespedeza, sweet clover, alfalfa, alsike and timothy. He also has 100 acres of bluegrass with ladino and lespedeza. Thus he has legume pasture from early spring to fall and bluegrass for winter range.

Reinking got 400 pounds of gain an acre from 80 acres of brome-alfalfa from May 15 to September 15. He ran 157 cattle on the pasture all winter. He rested it from April 15 to May 15 and turned in 105 steers. He increased the number to 262 on August 18. The pasture still had lots of grazing by the middle of September.

One of Reinking's brome-alfalfa mixtures was seeded in 1944 and it still is well-balanced. It was started with 3 tons of lime and 350 pounds of triple phosphate. It is grazed about 30 days, 3 head to the acre, and then rested for about the same period. The field got 82 pounds of nitrogen an acre in anhydrous ammonia in late March. Reinking said the growth was boosted materially.

"We give Reinking a lot of credit for the pioneer work he has done in grass production," says Lowry. But Lowry has done some pioneering also. Both the Reinking and Lowry farms have lots of visitors to see super-pastures.

Bluegrass still has a place in an all-around pasture program, Lowry believes. Of his 240 acres of grass, half is in bluegrass and the rest is in super-mixtures. Bluegrass makes good fall and winter grazing and a field of it is a good place for winter feeding. "We use

bluegrass in spring, too, for protection against bloat," says Lowry. "We watch our cattle closely and at the least sign of bloat on the super-pasture, we drive them back on bluegrass. When we don't pasture off the bluegrass in spring, we strip it for seed. Our seed harvest brought $20 an acre in 1950."

History of a bunch of steers tells how Lowry's pasture program operates. He bought calves weighing 334 pounds August 15. They were put on bluegrass in October. They ate 2 tons of corn silage each during winter and got a pound of protein each daily for 140 days. They were on super-pasture from spring until fall and weighed 825 pounds by September 25 when Lowry started giving them a grain finish. The gain of 489 pounds had been made on grass plus 2 tons of corn silage and 140 pounds of protein.

Lowry's cropland is limited to 80 acres. Corn is rotated with sweet clover and lespedeza. The sweet clover is turned under in spring for corn. The whole farm has been covered with rock phosphate. What hay is needed is taken from spots in the pasture where clovers are thickest.

Some of the Clay county super-pastures are turned into milk production. There is Bob Troutz, a young G. I. who bought 390 acres of run-down land in 1948. He is bringing it back with grass. He had seeded 90 acres by 1950. A 25-acre field of brome, alfalfa and ladino pastured 24 cows and a bull for 5 months. Milk checks for that period amounted to $3,500, or $2,690 above cost of hay and concentrate. That is better than $100 an acre net credit to pasture. Troutz is starting a beef unit. By the time he has his farm well seeded to grass and legumes he hopes to have a good start on a cow and calf program. The dairy cows are paying the beef herd foundation expense.

There is nothing particularly new in the way Clay county farmers establish super-pastures. Average soil treatment is 3 tons of lime and 1,000 pounds of rock phosphate worked well into the soil before seeding. The common mixture is brome, alfalfa and ladino. At seeding 150 pounds an acre of 4-16-4 is applied as a starter. From then on it is a matter of good management and fertilization. Clay county farmers don't believe they have the last word on good pastures. They follow the findings of Missouri Experiment Station tests. But if an idea looks good they try it no matter where they find it.

Reducing The Farm Gamble

Condensed from The Farmer

William H. Kircher

CHARLIE Martin had been getting along well since 1947 when he had rented the Tina Iverson half section farm near Cogswell in Sargent County, N. D. Corn had yielded up to 50 bushels per acre; wheat, 27 bushels, and flax as much as 13 bushels. Those were the top yields, of course, but other yields hadn't been bad. Anyway they were enough to make the place profitable.

Came 1950. The season got off to a late start. It was dry. On August 19th there was a hard, corn-killing freeze. The corn didn't look worth picking, and wasn't, but to get a little feed he picked it anyway. It made 2½ bushels per acre of miserably poor, washy ears. Flax yielded 2 bushels; wheat, 4.8 bushels, and oats, 15 bushels. That was as near a total crop failure as Charlie Martin had suffered since the blank years of 1934 and 1936. Yet when we stopped to visit with him a few days ago, he could say with truth to back him up that although he had suffered a loss last year, it wasn't heavy.

Like 1,132 others of the 1,219 farmers in Sargent County, and several thousands of others in the 50 counties of the country where government multiple crop insurance is offered, Charlie had gambled a little money against losing a lot. He had bought insurance, paid a cash premium of $117.09 to cover what amounted to his operating costs on 154 acres of oats, 91 acres of wheat, 59 acres of corn, and a patch of 7 acres of flax. Total of the coverage was $3,031.75. Receipts from the crop totaled $1,494.40 so Charlie Martin got an insurance settlement of $1,116.75.

Now in its fourth year of trial the kind of insurance Martin carried is beginning to show promise of doing what it was intended by its designers that it should do. This was to keep farmers from going broke if they ran into one or a string of bad years.

Starting in 1938 the Federal Crop Insurance Corporation began offering "all risk" insurance. Wheat was one of the first crops insured, then came flax, corn, cotton and others. Many Upper Midwest farmers are acquainted with this kind of insurance, know its

Reprinted by permission from The Farmer,
Saint Paul, Minnesota, March 17, 1951

virtues and its grievous faults. Its principle fault is that in uncertain farming areas premiums are high, and coverage is low. It couldn't be any other way because of the risk involved.

Facing the one obvious fact that insurance is needed most where the risk is greatest, and the other equally obvious fact that a high risk must be covered by a high premium, crop insurance men set about working out a new plan. Out of their efforts came multiple crop insurance. Through it risk is reduced by insuring all crops on a farm.

On another Sargent County, N. D. farm is a better example of the advantage of spreading the risk than the one on the place Charlie Martin is farming. This is the farm of Frank Vculek.

Frank also ran into weather trouble. He insured 913 acres of crops. Of the total 438.5 acres were in corn; 267 in wheat, and 207 in oats. Corn was struck by the August freeze, yielded only 7 bushels per acre, oats got off to a bad start so it was a near failure, but wheat made 13 bushels. That's not looked upon as a good crop in that wheat growing community, but it was enough to more than pay its way and cover the loss on some of the other land as well. Here is how Frank's situation worked out: He paid $598.91 for a total coverage of $12,214. He got $8,182.25 worth of crops, so his indemnity was $4,036.70. If corn alone had been insured on the Vculek farm, the net loss would have been heavier, and foreseeing that possibility, the premium would have been higher.

Let's see how this kind of insurance works out in an area of more certain weather and smaller farms. Take Goodhue County, Minn., one of two counties in the nation where multiple crop insurance was given its first trial in 1948. Last year, Leo Dreason insured 55 acres of corn and 66 acres of oats. The insurance cost him $53.62 for a coverage of $2,460. Neither oats nor corn yielded up to the insured amount so Mr. Dreason ended the year $968.23 short of the $2,460 for which he had been insured. He therefore, got a check for $968.23 from the Federal Crop Insurance Corporation.

Obviously the Federal Crop Insurance Corporation would have a very bad time with Congress, if all the insured farmers got more in indemnities than they paid out in premiums. Just as the vast majority of those carrying fire insurance don't collect on it, so those carrying multiple crop insurance don't collect. Even in the bad weather year of 1950 in Sargent County only 152 of the 1,132 insured farmers got indemnities. The intake of premiums in the county totaled $94,428.05. The outgo of indemnities was $79,-

706.05. Kandiyohi County, Minn. didn't have such a good record. Premiums collected there totaled $80,900 while indemnities went up to $150,000. Fortunately for Kandiyohi County, it has enough in reserve to pay the difference.

If premiums exceed indemnities the premium goes into a reserve fund such as the one in Kandiyohi County. The Federal Crop Insurance Corporation determines how much a county's reserve fund shall be in order to get a reduction in premiums. When the fund reaches that predetermined level the premiums are reduced 30%.

If an individual farmer has a seven-year record of no loss his premium is automatically reduced 25%. If he has been carrying the one-crop insurance without a loss, the time which he has carried that may be counted in the seven-year period on multiple crop insurance. Should this farmer live in a county which has a reduced premium by reason of having built up a sufficient reserve fund, he will get that 30% reduction plus the 25% he has earned for himself, or a total rate reduction of 55%.

In case indemnities in a county exceed premiums before that county has built a sufficient reserve to pay the difference, that difference comes out of the Federal Crop Insurance Corporation's revolving fund.

The premium and indemnity structure is based on a 20-year history of crop production in a given county. If, for example, wheat production averaged 11.1 bushels per acre as it had in Sargent County during the 20 years prior to the time the premium was being established, the FCIC men would use that as a base. From the base they deduct 40%. In the case of Sargent County this would amount to 4.4 bushels leaving 6.7 bushels as the amount for which a farmer will be compensated should he suffer a complete loss. To figure that premium and indemnity in terms of money, FCIC puts an arbitrary value on the crop. Currently this is $1.20 a bushel for corn, 95¢ for barley, $2.60 for flax, 55¢ for oats, and $1.80 for wheat.

To get only $17.50 an acre for a corn crop in Sargent County, N. D. or $30 an acre in Goodhue County, Minn., certainly would not yield a profit. It isn't intended that this should be insurance for profit. Rather it is to protect against cash out of pocket loss so that a farmer may stay in business even if a crop or two are wiped out.

Not all farmers in a county where multiple crop insurance is written are eligible for it. This may be due to the kind of land they are farming or to their having proved that they themselves are ineligible risks. Ineligible farm-

ers are those who have refused to pay their premiums, or who have suffered crop failure as a result of doing a consistently poor job of farming. Ineligible land in Sargent County, N. D. lies in three alkaline sections in the northeastern part of the county, and in 33 very sandy sections in the southwest corner. In Goodhue County, Minn., there are some bottom lands that are ineligible because of the danger of flooding.

In this fourth year of trial with multiple crop insurance, it is being written in only nine Minnesota counties, five in South Dakota, and five in North Dakota.

Farmers who are on eligible land in the trial counties may get insurance through their county PMA offices by applying before March 31st. If the premium is paid before June 30th, there is a 5% reduction. The net premium obtains between July 1st and October 31st, and after the latter date there is a 3% interest charged for the period to December 31st, and a 1% additional interest charge for each two-month period thereafter.

If the interest charges aren't sufficient to encourage a farmer to get his premium paid up, the FCIC has two effective ways of getting the money. It may deduct the amount of the premium from agricultural conservation payments or from CCC loans on stored crops.

Objection to this kind of insurance has in some instances come from companies writing hail insurance. For obvious reasons they don't want to be thrown into competition with government. FCIC men argue that they aren't. Said one of the latter: "A farmer shouldn't look upon this insurance as offering the same sort of protection hail insurance offers. On my own farm I take this kind of insurance before March 31st. Then if I see that I have a good crop coming on . . . a crop worth insuring against hail I also take out some hail insurance."

Praise for the new insurance comes not alone from many of the farmers who have enjoyed its benefits, but from others as well. Among the latter are some rural bankers who like it because it takes the risk out of their loans.

Whether the insurance will succeed to the point where FCIC spreads it to all agricultural counties of the nation will depend on the experience the next few years. Meanwhile, in counties where it has been offered from one-third to nearly 90% of farmers have bought it.

INDEX

BEEF CATTLE

Data on Inbred Carcasses ..... Nov., 1950
Make Beef from Grass ..... Nov., 1950
Breeders of Purebred Seed Stock ..... Dec., 1950
Economy in Good Feeding ..... Jan., 1951
Meat from Grass in Britain ..... Jan., 1951
New Tonic for Sick Cows ..... Jan., 1951
More Profitable Beef ..... Feb., 1951
Newer Feeding Knowledge ..... Feb., 1951
Good Way to Market Calves ..... Mar., 1951
Beef Cow's Milk Equipment ..... Mar., 1951
How to Buy a Bull ..... Apr., 1951
Free Martins ..... Apr., 1951
The Kind for Most Profit ..... Apr., 1951
T O Ranch ..... May, 1951

CONSERVATION

Nature's Balancing Act ..... June, 1950
How Much Water Have We? ..... June, 1950
New Era in Soil Fertility ..... June, 1950
Birds—First Line of Defense ..... July, 1950
This Fence Wears Its Own Rose ..... Oct., 1950
Plow Sole and Hardpan ..... Apr., 1951

CROPS

New Kinds of Rust ..... Dec., 1950
Renovate Broome Grass ..... Dec., 1950
Pre-Harvest Sprays on Alfalfa Seed ..... Dec., 1950
Rye Grass and Crimson Clover ..... Dec., 1950
20% More Corn ..... Jan., 1951
Molybdenum Aid to Alfalfa ..... Jan., 1951
Grassland Farming ..... Feb., 1951
Plant Roots ..... Feb., 1951
How to Grow Better Alfalfa ..... Mar., 1951
Blue Lupine—as a Cover Crop ..... Mar., 1951
Lespedeza Spreads Northward ..... Apr., 1951
Modern Wheat Production ..... Apr., 1951
Put the Bee on Legumes ..... Apr., 1951
Plant Corn Under Cover ..... Apr., 1951
Cultivation Essential ..... May, 1951
The Right Rotation ..... May, 1951
Underground War ..... May, 1951

DAIRY CATTLE

How to Get a Cow with Calf ..... Dec., 1950
Pasturage-Key to Southern Dairying ..... Dec., 1950
An Approved Dam Is a Better Cow ..... Dec., 1950
Double Your Herd Size? ..... Dec., 1950
Breeders of Purebred Seed Stock ..... Dec., 1950
*Heat-tolerant Dairy Crossbreds ..... Dec., 1950
Bovine Trichomoniasis ..... Jan., 1951
Determining Relative Return ..... Jan., 1951
Disease Control in Sweden ..... Jan., 1951
Cutting Cost of Making Milk ..... Feb., 1951
Dairy Research Work Expands ..... Feb., 1951
Crossbred Cows ..... Feb., 1951
Good Enough for the Bull? ..... Feb., 1951
Artificial Insemination ..... Feb., 1951
Cows Give Chilled Milk ..... Feb., 1951
Would You Sell Your Heifers ..... Mar., 1951
Udder Treatment—Milk Let-down ..... Mar., 1951
Loose Housing for Dairy Cattle ..... Mar., 1951
That Weak Calf Problem! ..... Apr., 1951
Good Breeding Efficiency ..... Apr., 1951
A Study of Acetonemia ..... May, 1951
Success with Calf Raising ..... May, 1951
Red Sindhi Dairy Cattle ..... May, 1951

FARM BUILDINGS

Paint—New Life for Buildings ..... Oct., 1950
Building of Masonry ..... Nov., 1950
Lighting the Farm Buildings ..... Dec., 1950
Farm Wiring Goes Underground ..... Jan., 1951
Sewage is no Problem ..... Jan., 1951
Paved Barnyards ..... Feb., 1951

FARM ECONOMICS

Changes in Farming ..... Nov., 1950
Pike County Miracle ..... Jan., 1951
Stumbling Block to Better Farming ..... Jan., 1951
Hired Men Take an Interest ..... Jan., 1951
What is a Farm Worth? ..... Mar., 1951
Production per Farm Worker ..... Apr., 1951
Balanced Farming in Missouri ..... Apr., 1951
Stretching Your Labor ..... Apr., 1951
Keep Leases Up-to-Date ..... May, 1951
Reorganization Would Pay ..... May, 1951

FARM EQUIPMENT AND MACHINERY

Food Freezers for Every Farm ..... Nov., 1950
Tractor Rodeo ..... Dec., 1950
Can You Afford a Field Chopper ..... Dec., 1950
Plastic Silage Cap ..... Dec., 1950
New Developments in Silos ..... Dec., 1950
Crankcase Moisture a Winter Hazard ..... Dec., 1950
Is Propane Practical Farm Power? ..... Dec., 1950
Life Span of Average Tractor ..... Jan., 1951
One Tool Does Three Jobs ..... Feb., 1951
Care of Disposal System ..... Feb., 1951
Vacuum Lines Need Cleaning ..... Mar., 1951
Reduce Your Electric Bill ..... Mar., 1951
Permanent Trench Silo ..... Mar., 1951
More Power on the Farm ..... Mar., 1951
Sprayer Speedometer ..... Mar., 1951
Not Enough Tile—Use a Pump ..... May, 1951
Weed Control Equipment ..... May, 1951

FEEDS

Harvesting Grass Silage ..... July, 1950
Feeding Soft Corn ..... Jan., 1951
Cutting Costs of Corn Silage ..... Jan., 1951
How to Buy Mixed Feeds ..... Mar., 1951
Making Silage Can be Easy ..... May, 1951

FERTILIZERS & COMPOSTS

The Value of Rare Elements ..... A-S, 1950
Manure Means Money ..... A-S, 1950
How Use of Fertilizer Began ..... A-S, 1950
Preserving Organic Matter ..... Oct., 1950
Liquid Manure ..... Nov., 1950
Anhydrous Ammonia ..... Dec., 1950
What about Liming? ..... Jan., 1951
Phosphorus for Good Yields ..... Feb., 1951
The Magic of Nitrogen ..... Feb., 1951
Improve Poultry Manure ..... Mar., 1951
Get the Good out of Phosphate ..... Apr., 1951
Manure Doubles in Value ..... Apr., 1951

FORESTRY

*How to Measure Standing Timber ..... Mar., 1950
Partnership in the Woods ..... Apr., 1950
Wood Becomes a Cash Crop ..... Jan., 1951
Durisol from Wood Shavings ..... Jan., 1951
Chestnuts again in Our Time ..... Feb., 1951
Be Your Own Woods Boss ..... Mar., 1951

INDEX

FRUIT

*Sawdust Mulch for Blueberries ——July, 1950
Virus Problem in Berry Crops ——A-S, 1950
The Blueberry Story ——Oct., 1950
Planting Plans and Techniques ——Jan., 1951
Build up Humus in the Orchard ——Apr., 1951
Maleic Hydrazide ——Apr., 1951
1000 Bushels of Apples an Acre ——Apr., 1951
Minor Elements—Major Problems ——May, 1951

HOGS

Wonder Drug Speeds Growth ——A-S, 1950
Reports on Swine Experiments ——A-S, 1950
Self Feeding is More Efficient ——Oct., 1950
Feed Best to 75 Pounds ——Oct., 1950
Five Pigs to Break Even ——Nov., 1950
Feeding Hogs for Profit ——Nov., 1950
When to Sell Sows ——Dec., 1950
Death Losses in Newborn Pigs ——Jan., 1951
Why Paint Sow's Belly Red? ——Jan., 1951
Abortion in Sow Herds ——Jan., 1951
Two New Breeds of Hogs ——Jan., 1951
Feeding the Young Pig ——Feb., 1951
APF and Antibiotics ——Feb., 1951
Feeding the Bred Sow ——Mar., 1951
More Pork from Less Feed ——Apr., 1951
Big Litters-Weaning Weights ——Apr., 1951
New Hope for Runts ——May, 1951

HORSES

The Nutrition of Horses ——Oct., 1950
The Feeding of Horses ——Nov., 1950

INSECTS & INSECTICIDES

Toxaphane Gets Cutworms on Corn ——May, 1950
*Corn Borer Control ——July, 1950
A New Way to Kill Bugs ——Nov., 1950
Spittlebug Control ——Apr., 1951
Tomorrow's Insecticides ——Apr., 1951

PASTURES

New Grass for the Western Range ——Nov., 1950
Fertilization of Long-Lay Meadows ——Dec., 1950
What about Palatability ——Dec., 1950
Sandy Acres into New Pastures ——Dec., 1950
Pasture Partners ——Jan., 1951
Tall Fescue ——Feb., 1951
What a Pasture System ——Feb., 1951
Pangola Grass ——Feb., 1951
Building Better Pastures ——Mar., 1951
Renovation Boosts Pasture Yields ——Mar., 1951
Manure on Pastures ——May, 1951

POULTRY

Range Rearing Lowers Cost ——A-S, 1950
Pounds from Pills ——Oct., 1950
Antibiotics make Good Feeds Better ——Oct., 1950
Are Roosts Necessary ——Oct., 1950
"Break-Even" for Broilers ——Nov., 1950
What's New in Poultry Feeding ——Dec., 1950
Watch Out for Erysipelas ——Dec., 1950
Interior Quality ——Dec., 1950
Improving Broiler Growth ——Jan., 1951
Winter Feeding for Eggs ——Jan., 1951
Chick Sexing ——Jan., 1951
Research Gives the Answers ——Feb., 1951
Less Work and More Hens ——Feb., 1951
Fans Solve Ventilating Problems ——Feb., 1951
Saving Feed Dollars ——Mar., 1951
High Profit per Hen ——Apr., 1951
What is a 'Hybrid' Chicken? ——Apr., 1951
Better Pasture for Pullets ——May, 1951
Turkey Fryers ——May, 1951

SHEEP & GOATS

More Lambs Earlier ——Oct., 1950
Don't Let Wool Fool You ——Nov., 1950
Hothouse Lambs ——Nov., 1950
Sheep May Sport New Brands ——Dec., 1950
Look to Your Rams! ——Feb., 1951
Two Lamb Crops a Year? ——Feb., 1951
More Trouble on the Range ——Mar., 1951
Grub Control in Sheep ——Mar., 1951
Problems for Purebred Breeder ——Apr., 1951
Shots that Save Lambs ——May, 1951
Pregnancy Disease in Ewes ——May, 1951
Crossbred Lambs ——May, 1951

SOILS

Tests at McCredie Farm ——Oct., 1950
Liquid Nitrogen on a Custom Basis ——Oct., 1950
Soil Fertility for Sale ——Nov., 1950
Oklahoma Plans Soil Testing ——Dec., 1950
Crop Residues on Surface of Ground ——Dec., 1950
Legumes Help Build Soils ——Mar., 1951
Correcting Soil Deficiency ——May, 1951
Gypsum Improves Wet Soils ——May, 1951
New Soil Testing Service ——May, 1951

VEGETABLES

Spray Vegetables to Control Weeds ——July, 1950
Asparagus—Favorite Vegetable ——A-S, 1950
Sulphur Answer to Potato Scab ——Jan., 1951
*Use a Starter Solution ——Feb., 1951
Grow Better Sweetpotatoes ——Mar., 1951
If You Want Early Tomatoes! ——Apr., 1951

WEEDS

Chemical Brush Control ——Dec., 1950
Control of Rocket and Mustard ——Jan., 1951
Range Trouble—Halogeton ——Mar., 1951
Wider Use of Weed Killers ——Mar., 1951
Chemical Aid in Weed Control ——Apr., 1951
Broom Sedge and Tickle Grass ——Apr., 1951
An Aluminum Mulch ——May, 1951

MISCELLANEOUS

Ways to Repel Deer ——A-S, 1950
Experiment Station Founder ——Oct., 1950
Atomic Ranch at Oak Ridge ——Oct., 1950
Machine-Baiting to Control Mice ——Oct., 1950
Farm Woodland Cooperative ——Nov., 1950
Farming—Greatest of Professions ——Nov., 1950
"Goodbye Mr. Woodchuck" ——Nov., 1950
History of Agricultural Teaching ——Nov., 1950
Some Snakes Are Helpful ——Dec., 1950
*New Agent in Food Preservation ——Dec., 1950
*New Spray Discourages Deer ——Dec., 1950
*Rat Killers Ready ——Dec., 1950
Big Business on the Plains ——Feb., 1951
A New Rat Destroyer ——Feb., 1951
War on Nematodes ——Feb., 1951
Less Danger for Livestock ——Mar., 1951
Defoliation Chemicals ——Mar., 1951
Egypt Today, Tomorrow ——Apr., 1951
Put an End to Deer Damage ——Apr., 1951
Farming in Alaska ——May, 1951
Rainfall from Reluctant Clouds ——May, 1951
The Mighty Atom ——May, 1951

* Short Articles.

FOR THE FARMER'S LIBRARY

Feeds and Feeding—By F. B. Morrison, Professor, Animal Husbandry and Nutrition, Cornell University. Morrison Press. $7.00.

Animal Science—By W. E. Ensminger, Chairman, Department of Animal Husbandry, Washington State College. Illustrated by R. F. Johnson, California Polytechnic College. Interstate Publishing Company. $6.00.

Dairy Science—By W. E. Petersen, Asso. Prof. Dairy Husbandry, University of Minnesota. J. B. Lippincott. $5.00.

Animal Sanitation and Disease Control—By R. R. Dykstra, Dean, School of Veterinary Medicine, Kansas State College. The Interstate Printers & Publishers. $5.00.

Pork Production—By William W. Smith, Professor of Animal Husbandry, Purdue University. The Macmillan Company. $5.00.

Successful Poultry Management—By Morley A. Jull, Professor and Head of Poultry Dept., Univ. of Maryland. McGraw-Hill Book Co., Inc. $3.75.

Fruit Science—By Norman F. Childers, Professor and Research Specialist in Horticulture, N. J. Agri. Exp. Station. J. B. Lippincott Co. $5.00.

Soil Conservation—By Hugh Hammond Bennett, Chief, S.C.S., US.D.A. McGraw-Hill Book Co., Inc. $6.50.

Forage Crops—By Gilbert A. Ahlgren, Professor of Farm Crops, Rutgers University, and Research Specialist, New Jersey Agricultural Experiment Station. McGraw-Hill Book Company. $5.50.

Principles of Field Crop Production—By John H. Martin, Senior Agronomist, Bureau of Plant Industry, U.S.D.A., and Warren H. Leonard, Professor of Agronomy, Colorado A. & M. College. The Macmillan Company. $6.00.

Weeds: Guardians of the Soil—written in praise of weeds—By Joseph A. Cocannour, Professor of Botany and Conservation, University of Oklahoma. The Devin-Adair Company. $2.75.

Hunger Signs in Crops—A symposium, edited by Gove Hamboge. Again available. Published by the American Society of Agronomy and the National Fertilizer Association. $4.50.

Electricity in the Home and on the Farm—By Forrest B. Wright, Ph.D., Professor of Agricultural Engineering, N. Y. State College of Agriculture, Cornell University. John Wiley & Sons, Inc. 3rd Edition. $3.96.

Home Veterinarian's Handbook—By E. T. Baker, Veterinarian. The Macmillan Company. $3.00.

Mushroom Growing Today—By Fred C. Atkins, Chairman-elect of the Mushroom Growers' Asso., of Great Britain. The Macmillan Company. $2.50. Illustrated.

Out of the Earth—By Louis Bromfield, Farmer and Author. Harper & Brothers. $4.00.

Vertical Farm Diversification—By D. Howard Doane, Farm-Management Expert. University of Oklahoma Press. $2.75.

For the convenience of our readers, books listed may be purchased through this Department. Address Farmer's Digest, Ambler, Pa.

The 4-H Club Pledge

"4-H Club work started in 1914 so that it has been enriching the lives of America's rural youth for 37 years. One can roughly approximate the total number of boys and girls who have memorized the pledge and who have dedicated themselves to carry out the ideals it embodies. Last year, alone, there were nearly 2,000,000 boys and girls enrolled in 4-H work, with 251,000 volunteer leaders. One of the first duties of new members is to memorize the pledge, and each 4-H club meeting opens with its recital:

I pledge
My head to clearer thinking
My heart to greater loyalty
My hands to larger service
My health to better living
for
My club, my community, and my country.

The 4-H club activities give our rural boys and girls an opportunity to learn how to use various skills that will help them in their work and play throughout their lifetime.

Otis Hall, author of the National 4-H Club pledge, has been dead for fifteen years, but the impact of his ideals lives on in the lives of millions of adult men and women whose character in their youth was shaped by his philosophy and leadership."

—From FARM FINANCE
Federal Reserve Bank of Boston

Business Press, Inc.
Lancaster, Pa.